APRIL 1956
VOL. LI No. 4

41.8
V69

VETERINARY Medicine

Established 1905

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features in this issue...

The Southern—Florida Issue
Light Horse Practice
Past, Present, and Future of Systemic Parasiticides
Fluid and Electolyte Balance in Surgery
Digestive Disturbances in Cattle
Urinary Diseases of Small Animals
Observations on Canine Distemper
Adrenal Corticoids in Surgical Patients
Blood Transfusion and Parenteral Fluid Therapy
Host Resistance to Bacteria in Traumatic Shock
Surgical Seminar
New Anesthetic for Veterinary Use

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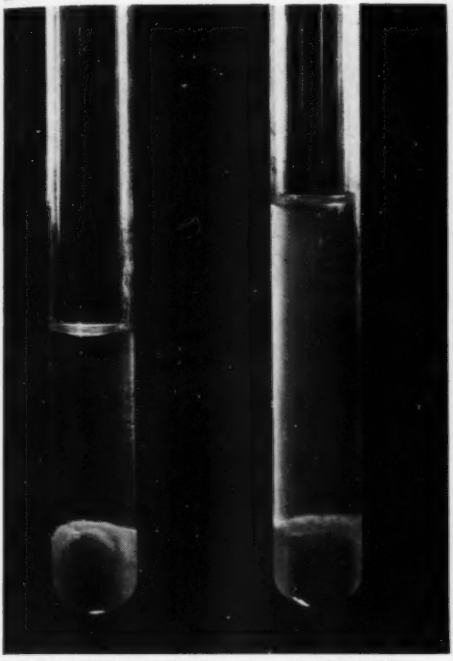

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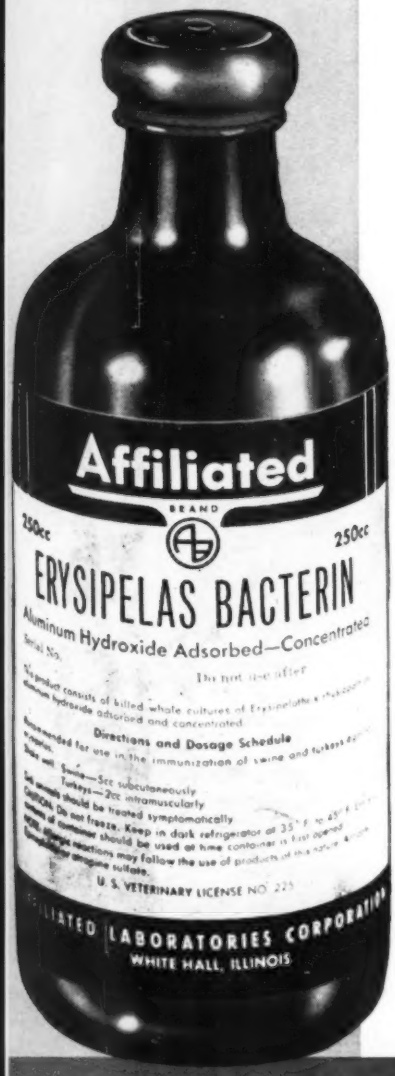

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Virus Synthesis

Widely heralded as the greatest scientific achievement of the year, and perhaps of the century, are the results of study of viruses. These include separation of living particles into component parts and restoration of activity by rejoining them. Studies by University of California scientists (Proc. National Academy of Science, Oct., 1955) are claimed as partial synthesis of life for the first time by assembling a self-duplicating system in a test tube from ingredients of themselves inactive biologically.

Working with viruses, Drs. Fraenkel-Conrat and Williams succeeded in separating tobacco mosaic virus into protein and nucleic acid. Separately they prove inactive. When reformed, the combination proved disease producing.

Importance of these findings are far-reaching and of especial interest to veterinarians. Diseases of animals caused by virus agents are responsible for major losses. Possibility exists that it may be possible to recombine components for "tailor-made" viruses that are antigenic without being infective.

Procine Brucellosis

Imperfection of the serum agglutination test for swine brucellosis has handicapped identification of infected droves and those free of infection. Incomplete agglutination of samples, variety of interpretations in various dilutions and false reactions have failed to positively classify individual animals. This has been a factor limiting progress of the program of eradication of this disease in cattle.

Some unknown substance in the blood of some swine is believed responsible for false positive reaction. Researchers now find (Ag. Res., Feb., 1956) that this unknown substance is inactivated, as far as interference with accurate test results are concerned, by heating samples to 56 C. and holding them at this temperature for 18 hours.

Considering the fact that swine brucellosis is transmissible to man and that existence of the disease in swine imperils the eradication program of bovine brucellosis, these findings are of major significance.

VETERINARY Medicine

Established 1905

Registered in U. S. Patent Office

A Monthly Magazine Devoted to the Promotion of the Art and Science of Veterinary Medicine

Vol. LI **APRIL 1956** **No. 4**

Published Monthly by the

VETERINARY MEDICINE PUBLISHING CO.

Suite 803, Livestock Exchange Building
Kansas City 2, Missouri, U.S.A.
Telephone: Victor 2-2985

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SUBSCRIPTION RATES. One year, $5.00; two years, $8.75; three years, $12.00. Single copy, 50c. U. S. Funds. Postage prepaid. Authorized agents will present letter of collection authority. Pay no money to others.

Entered as second class matter at the post office at Kansas City, Missouri. Entered as second class matter under the title of the American Journal of Veterinary Medicine, July 19, 1910, at Chicago, Illinois, under the Act of March 3, 1879.

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CHANGE OF ADDRESS: Prompt notice of change of address is requested to assure accurate mailing, giving old and new address. Address all communications to Veterinary Medicine, Suite 803, Livestock Exchange Bldg., Kansas City 2, Missouri.

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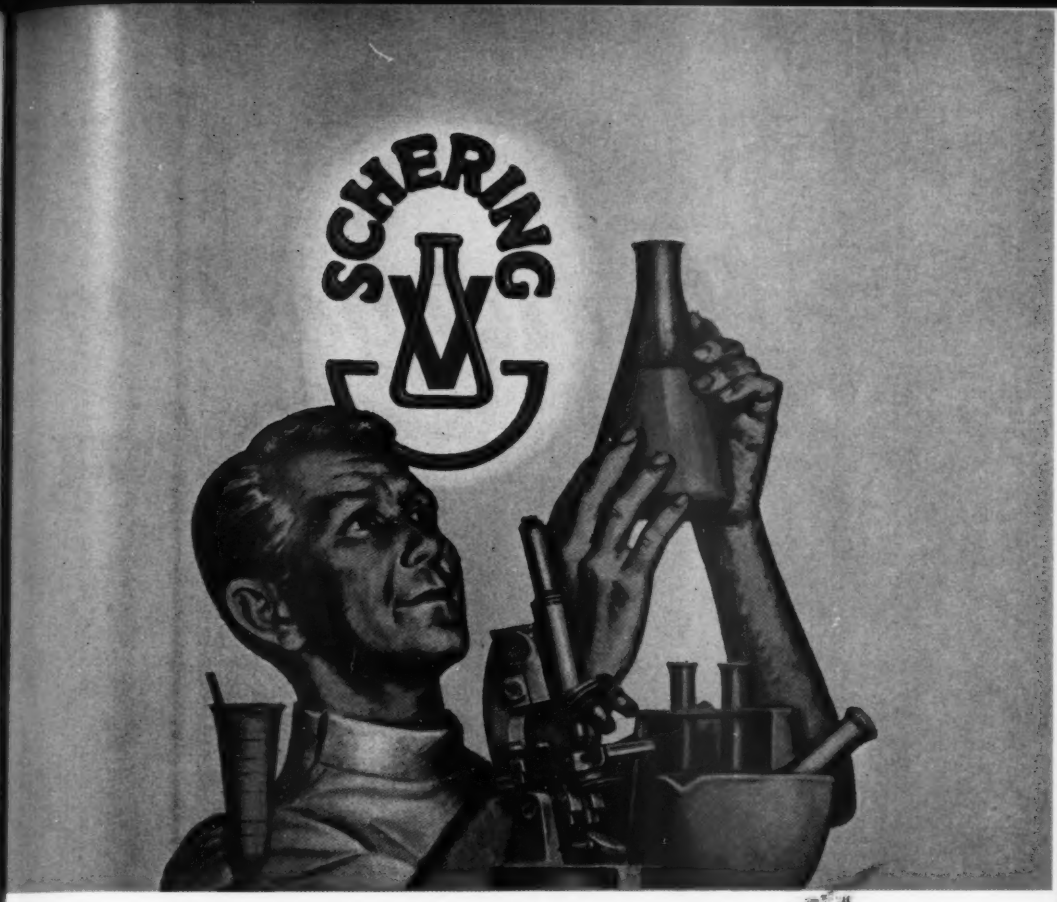

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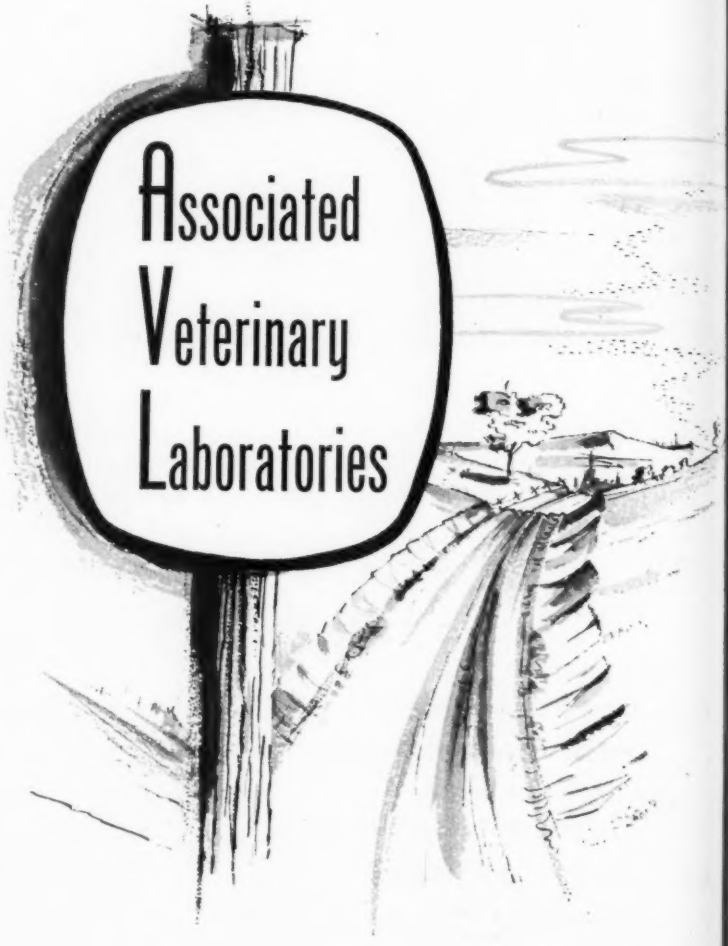

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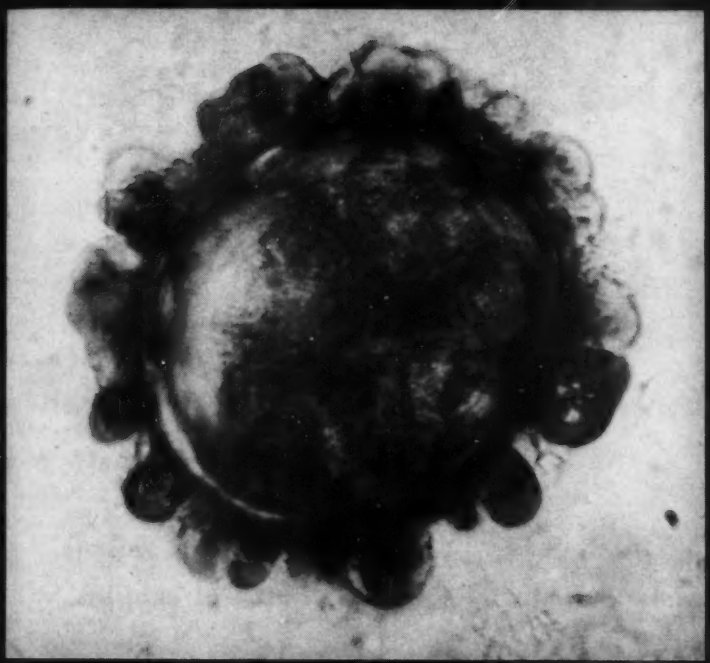

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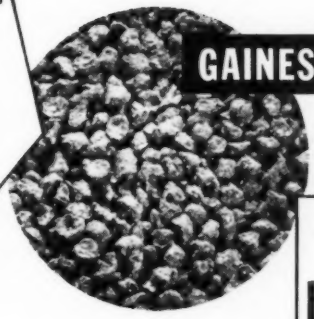

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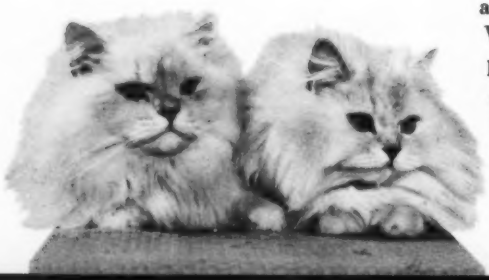

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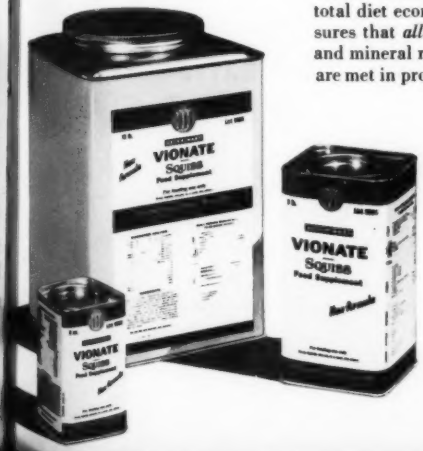

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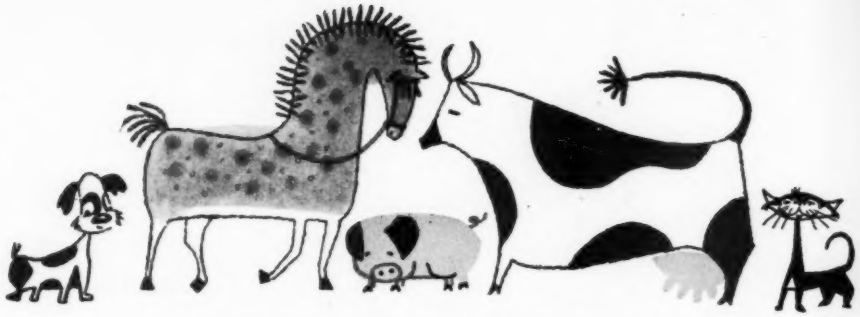

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1. Rachman, M., and Frucht, T. R.: Vet. Med. *49*:341, 1954.
2. Sternfels, M.: Vet. Med. *50*:82, 1955.

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References:

[1] Drury, A.R.: Vet. Med. 47: 407-411, 1952.

[2] Kitchen, H., and Waksman, S.: J.A.V.M.A., Vol. 127, No. 942: 261-274, Sept., 1955.

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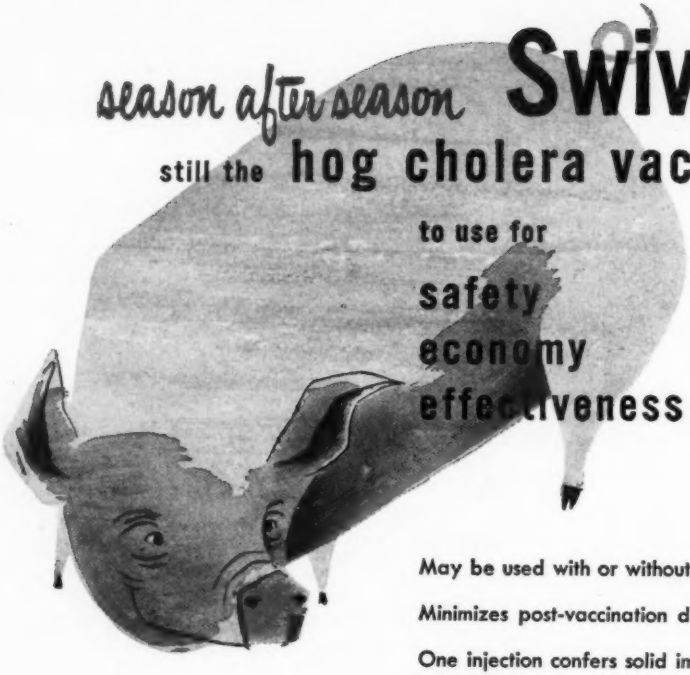

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Combined Meeting Of The Southern Veterinary Medical Association And The Florida State Veterinary Medical Association

IN this issue of VETERINARY MEDICINE is contained most of the literary program of the 38th annual meeting of the Southern Veterinary Medical Association and the 26th annual meeting of the Florida State Veterinary Medical Association, held as a combined meeting at Jacksonville, Florida, October 16-19, 1955.

The Southern Veterinary Medical Association, organized in 1916, includes membership

Dean Thomas J. Jones, President of the Southern Veterinary Medical Association.

of veterinarians in 14 states of the South, of which Florida is one. Meetings of this group are held in cities from the East Coast to Texas. There are no membership dues for the Southern. Membership in any one of the member states qualifies those located in that area as members of the Southern. During its existence this large and active regional association has furnished leadership in all branches of the profesion and is supported actively by practitioners, federal and state veterinarians, educators, research men, and public health veterinarians. Usually, its meetings are held during October or early November whereas most of the member states hold individual meetings earlier in the season. Since the fall season is the most advantageous for meeting of the Florida group the Southern and Florida State associations have had in the past, frequent conflicting meeting dates. This year a combined meeting solved the problem of meeting conflict and the well attended meeting in Jacksonville featured discussions of problems with which all veterinarians of the South are concerned.

The Florida group were hosts. Dr. Myron C. Gray, Jacksonville was general chairman for this meeting and Dr. William F. Jackson, Lakeland, Dr. R. F. Minnick, St. Petersburg, and Dr. E. F. Thomas, Sarasota made up the all Florida Program Committee. To these men go much of the credit for selection of program subject matter, the excellent quality of which kept all in attendance alert.

Much that was presented at this meeting could not be published because of its nature. Only those in attendance gained from prepared motion pictures shown, illustrated lectures, and demonstrations. This constituted no small portion of the entire program nor was any of it of lesser importance than that which lent itself to publication.

By way of observation it might be said that the program was crowded. Certainly discussions on vital subjects followed one another in

Dr. A. A. Husman, Secretary of the Southern Veterinary Medical Association.

succession as scheduled. Interest was intense and responsive as was evident by questions in such number that time reserved at luncheon for this Q and A feature was insufficient to answer all questions posed. Those who attended seeking advanced information did not return home disappointed.

Social functions were characterized as usual

by being most pleasurable. These included a preconvention golf tournament, football game, Veterinary Night at Orange Park Kennel Club, oyster roast at the home of Dr. Peter Roy, hospitality hour on Sunday evening, smorgasbord and entertainment on Monday and the formal banquet and dance on Tuesday evening. A program for the visiting ladies was arranged for each day of the meeting which allowed for their inclusion with the men at after-hours functions.

Space limitations in this issue made necessary delay in publication of several excellent manuscripts which will appear in the forthcoming (May) issue. These include, Some Nervous Disorders of Horses and Cattle, by Dr. John T. McGrath; Use of Newer Corticosteroids in Animals, by J. Lavere Davidson; General Anesthesia versus Local Anesthesia in Small Animal Practice, by Dr. K. W. Smith, and a few short subjects.

Each of the Associations held annual business meetings. Officers selected to serve the Southern for the coming year included: Dr. Thomas J. Jones, dean, School of Veterinary Medicine, University of Georgia, Athens, president; Dr. Eddie H. Durr, practitioner, Jackson, Mississippi, president-elect; Dr. Clay C. Van Gremp, practitioner, Decatur, Georgia, and Dr. Edward E. Chambers, Chattanooga, Tennessee, vice presidents. Dr. A. A. Husman, Raleigh, North Carolina was reelected secretary.

New officers of the Florida State Veterinary Medical Association were selected during the business session of that group. Dr. Peter S. Roy, Jacksonville was advanced from the position of president-elect to president; and Dr. A. E. Whaley, Kissimmee was chosen as president-elect. Dr. Robert P. Knowles, Miami was reelected as secretary.

Synthetic Furs No Competition to Fur Breeders

In an editorial appearing in the *American Fur Breeder* for January 1956, Editor Marshall Reinig states that "mink is in no jeopardy from any competition, man made or otherwise. The only real and very big threat to the mink farmer's economy is in overproduction of his own commodity."

Quotations from other authorities point out that "man made mink" is cloth made in imitation of fur and is no more likely to replace fur than are artificial flowers likely to run the florist out of business.

The unfortunate situation regarding restrictions of labeling also were pointed out. In this, apparent injustices are suffered under the Fur Products Labeling Act since, by these restrictions, fur products may not be labeled in terms of another fur. No such restrictions apply to cloth prepared as pile fabrics made to resemble natural fur.

▾ ▾ ▾

Iowa Conference for Veterinarians

The Annual Conference for Veterinarians will be held in air conditioned rooms, Memorial Union, Iowa State College, Ames, Iowa on July 17 and 18, 1956.

The technical program has been divided into Large and Small Animal Sections with closed circuit television programs interspersed between technical papers.

A special feature will be a banquet and dedication ceremonies celebrating the completion of the large Diagnostic Laboratory. Dr. John Herrick and Dr. D. L. Baker are co-chairmen of the conference.

Officers of the Florida State Veterinary Medical Association. (l. to r.) Dr. Robert P. Knowles, Miami, secretary; Dr. Peter S. Roy, Jacksonville, president; and Dr. A. E. Whaley, Kissimmee, president-elect.

Light Horse Practice†

WM. F. RILEY, JR.,* D.V.M., M.S., East Lansing, Michigan

THE ever-changing modern day methods and therapeutics has its reflection in all branches of veterinary medicine. The area of light horse practice is no exception. As a matter of fact, the equine practitioner often receives the latest information from a client, long before he is able to obtain the same information in print. This is particularly true of the Thoroughbred industry wherein quite frequently a physician or surgeon is consulted as well as the veterinarian.

Today, I should like to confine my remarks to some specific points regarding our approach to several practice entities and the results of our observations and treatments.

Intra-articular Hydrocortisone

During the past year or so we have used hydrocortisone acetate and more recently hydrocortisone combined with neomycin (neocortef)®[1], on a great many cases of acute and chronic lameness. Our results have been good to excellent in the majority of acute cases. However, an adequate period of rest still must be allowed in conjunction with treatment. Where rest was not given, relapses occurred as would be expected. Chronic cases as a rule do not respond satisfactorily, particularly where proliferative changes were evident on *x*-ray, as in the carpus.

Treatment schedule usually consists of two to four intra-articular injections spaced at 48- to 72-hour intervals. Occasionally a flare up in local inflammation would accompany the second injection so that the third would be delayed an extra day or so. The dosage has averaged 150-250 mg. per injection. The incorporation of neomycin with the hydrocortisone seems an excellent combination.

We have found hydrocortisone useful in treating acute periostitis (bucked shins) carpitis, tarsitis, gonitis, metacarpal-phalangeal arthritis, and to some extent coxitis. Unfortunately most of our cases of the latter group had been quite chronic before being presented. Navicular bursitis has been variable but mostly disappointing in its response to this line of therapy. Bog spavins have not responded uniformly, and some that appeared much improved required further treatment in 30 to 90 days. Olecranon bursitis has been helped but the fibrous capsule still remains. Many are infected and are not suitable for hydrocortisone therapy. The latter type are better freely drained and treatment carried out using veridase®[2] (streptokinase-streptodornase) and a broad spectrum antibiotic.

Fludrocortisone Acetate

During the past summer months opportunity was afforded to use a newer preparation known as fludrocortisone acetate®[3]. This preparation is credited as having up to 25 times the potency of regular intra-articular hydrocortisone. Thus,

†Presented at the 38th annual meeting of the Southern-Florida State Veterinary Medical Associations, Jacksonville, Florida, Oct. 16-19, 1955.

*Department of Surgery and Medicine, College of Veterinary Medicine, Michigan State University.

®[1]The Upjohn Co., Kalamazoo, Mich.
®[2]Lederle Laboratories, Div., Pearl River, N. Y.
®[3]Merck & Co., Raway, N. J.

1 cc. with a 10 mg. content of fludrocortisone would be equivalent to 250 mg. of hydrocortisone. An added advantage also presented itself in that it can be used intramuscularly as well as intra-articularly.

Our experience has been short with this product but to date it looks quite promising. Our dosage has been 4 to 5 cc. daily for three to five days. This gives the equivalent of 1 gm. of hydrocortisone daily. Usually 1 to 2 cc. are injected into the joint involved and the balance of the treatment administered intramuscularly for three to five days. Two cases of acute gonitis have responded dramatically as well as one case of navicular bursitis. In several cases of obscure or indeterminate lameness, especially in pacers, it has been remarkable. If relief is effected it is usually apparent by the third day of treatment.

Intravenous Hydrocortisone

During the past summer months opportunity presented to attend eight cases of heatstroke in horses. To each 500 cc. of normal saline and 5% dextrose solution was added 100 mg. of hydrocortisone. The product used was infusion concentrate hydrocortone®[4]. This was administered rather slowly and tolerated quite well. No untoward symptoms resulted, and in all cases the horses made a rapid and satisfactory recovery. There is no question in my mind but that the hydrocortisone was responsible for the rapid response. No other circulatory stimulant was used.

The same procedure has been used in the hospital in two cases of postoperative shock with the same satisfactory results. Likewise acute laminitis and lymphangitis are benefited although other established methods of therapy need be also instigated in these two conditions to ensure complete recovery. Proctor[1] at Lexington, uses the intravenous hydrocortisone quite successfully on obscure lameness. His procedure is to administer one infusion every 48 hours for a total of five or six injections. We have been able to duplicate Proctor's results in several cases using the intravenous hydrocortisone. Adrenocorticotrophic hormone (ACTH) combined with vitamin B_{12} injections has also apparently been of much benefit to horses that were sore, tied up, or exhibited indefinite symptoms of shoulder or hip lameness. The dosage most commonly used was 200 to 300 units of adrenomone®[5] with 0.5 to 1 gm. of injectable vitamin B_{12} given daily for three to five days. Relief was only temporary and pain returned when the injections ceased if the lameness had been allowed to become chronic. The cost of the treatment is also prohibitive in all but race horses, high class hunters, or show horses.

Wound Treatment

Deep puncture wounds of the musculature, open joints or those wounds involving the periosteum and compact bone tissue in horses have always been exceedingly troublesome. Often these become chronic fistulae or heal slowly at best. During the past four months we have had very satisfactory results using a combination of veridase®[3] (streptokinase-streptodornase — 25,000 units) with placental plasminogen (1-10,000). The two are mixed together in normal saline and administered intramuscularly once each day for a period of usually three to four days. A broad spectrum antibiotic is also administered.

Results are dramatic in most cases. One case of a severe swelling of the forearm due to a deep puncture wound was presented. This injury occurred several days earlier. Edema extended out into the pectoral region, and the entire leg was completely swollen so as to be nearly four times the size of its mate. The above treatment, plus 1 gm. of polyotic®[2] changed the character of the discharges from purulent to a healthy looking serous discharge in 36 hours. Swelling began to recede in 24 hours and the horse began to flex the knee slightly and move about some. By the third day, all symptoms were nicely regressing, so that by the sixth day the entire swelling had subsided and the puncture wound had completely closed. An uneventful recovery ensued.

The same treatment has been successful in handling open infected joints in horses. In addition to the parental treatment, however, we have injected a few cubic centimeters of the veridase-plasminogen solution into the joint itself. Veridase-plasminogen therapy seems to be definitely superior to antibiotic therapy alone in these cases. In addition to the above we have treated one mandibular bone fistula, that was secondary to a kick, and two cases of severe inflammation and cellulitis from trauma in which there were no open wounds. They responded nicely with swelling and pain subsiding by the 48th hour so that only three injections were made in these two cases.

Granulating wounds of the lower extremities

®[4]Sharp & Dohme, Div. of Merck & Co., Phil., Pa.
®[5]Armour Veterinary Laboratories, Chicago, Ill.

of the horse are most annoying to treat in many cases. These respond nicely to applications of hydrocortisone ointment (topical) applied daily under bandage. We have used several commercial topical products including a fluorohydrocortisone acetate topical ointment (0.1%). Almost dramatic results were obtained with the latter preparation. A thin film of the ointment was spread on gauze and held in contact with the granulation by bandage. A 10 gm. tube gave nine or ten treatments to an area the size of a man's open hand. The surface of the granulation can be seen to flatten more each day, so that in ten days to two weeks epithelium will bridge the wound. At this time it is left open, and astringents applied.

Fractures

Various methods are employed depending upon the location of the fracture, the breed of horse, its age, and mainly its value. In general one of three methods of treatment are usually employed in handling fractures in the horse. Transverse pinning utilizing pins, clamps and bars incorporated in a plaster of paris cast fortified with melmac® orthopedic composition is the usual choice for fractures of the long bones of the limb. Fractures of the mandible in colts and calves have responded well to intramedullary pinning. In adult horses we have used the Kirschner splint on two cases of fracture of the rami of the mandibles.

Fractures of the splint bones are operated upon to remove the distal fragment, usually under local anesthesia. Care must be exercised to remove all the periosteum of the distal segment at the time of surgery. A pressure bandage is maintained for several days and veridase administered with a suitable antibiotic for three or four days to prevent undue filling and subsequent scar tissue formation at the surgical site. Standardbreds appear to be affected frequently with this type of fracture.

Fractures of the third phalanx, proximal sesamoids, and distal sesamoid are not given any fixation. If rest and time do not attain soundness, the volar, plantor and digital nerves are blocked commencing with the digital on the side the fracture is located. If blocking gives relief a corresponding neurectomy is performed.

(1) Incision, right flank, for ovariectomy in the mare. (2) Neoplastic ovary brought to surface through flank incision. (3) Normal ovary being removed with spraying ecraseur via flank incision. (4) Closure of incision, using No. 2 chromic catgut, doubled muscle layers. (5) Incision approximated; skin closure with umbilical tape, mattress sutures plastic surgical dressing applied. (6) Comparison of neoplastic and normal ovary following successful extirpation.

Abdominal Surgery

During the past two years, we have performed several operations on horses, wherein it was necessary to invade the abdominal cavity by way of a laparotomy. One recent case was a mare with one ovary far too large to remove by the vaginal route (see figures 1 to 6) and the other a cryptorchid castration that had a testicle retained in the abdomen on an extremely short cord. It could not be brought up to the internal vaginal ring.

These two cases were fasted lightly and given chloral hydrate (40 gm.) and magnesium sulfate (30 gm.) solution intravenously. An infiltration block of 2% procaine completed the anesthesia. One may be criticized for not using drapes, but I did not use them. I merely scrubbed a generous surface in the flank, and had several sterile turkish towels at hand should it be necessary to use some sort of shroud. They were never needed. The ovarian tumor had an adherent portion of bowel wall that had to be dissected away and the bowel wall closed in two areas to repair tears. Catgut (no. 2-20-day) was used to close the peritoneum and muscle layers and umbilical tape the skin. A liquid plastic dressing (aeroderm)[®7] was sprayed on the incisions. Combiotic[®8] and intravenous sulfamerazine solution was administered postoperatively. Both cases made uneventful recoveries.

The same technic has been successful in repairing several abdominal hernias due to accidents in adult horses. One precaution I would mention is do not attempt to operate through too small an incision if the flank approach is used in the adult horse. One finds the musculature to be as much as eight inches thick so that the surgeon's arm will seriously traumatize muscle fibers while working in a tight incision. This may be followed by poor healing, or healing by secondary intention following local suppuration. One other point is important. Do not put in too many muscle sutures. Space them one inch apart, tie the suture knots tight but not the sutures. If they are too tight, some sloughing will occur about the sixth or seventh day.

Pyropuncture-firing

It is still my considered opinion that firing, properly used at the proper time, accomplishes about as much good as any other single method or form of therapy we have at our disposal for the relief of certain lameness. I am convinced from nearly 20 years observation that rest alone does not accomplish, by and large, the same satisfactory results as firing combined with proper rest. I fire many knees, tendons, ankles, and pasterns every year and have the satisfaction of seeing many horses so treated go back, win races, and remain sound. Firing is not a cure-all and unfortunately like many things that have some good, it is overdone.

There are many objections to firing. Some veterinarians maintain it is cruel. With proper anesthesia, and careful supervision following its application I do not feel it is so. Rarely, if ever does a horse refuse to eat or drink the day following firing, in my experience. As a matter of actual fact, the area fired seems in many cases to be less sensitive than normal skin. Other veterinarians condemn it as cruel because in reality they are afraid to fire a horse. Instead they dispense some escarotic liquid that is far more painful and of less benefit than firing. The third reason for objection is often the result of disappointing experiences with firing. Hopeless cases are fired with naturally poor results. Ruptured tendons, badly torn suspensories, misdiagnosed conditions, all contribute to disappointing results.

While on the subject of firing, I had the pleasure of visiting with Dr. Roy Baldwin of Hamilton, Ontario some time ago. He has adapted propane gas to firing. A 12-foot plastic hose connects a short tank of four-inch seamless pipe to a lightweight handle. To this handle he has attached the old ether cautery point holder and copper Bell point. This handle has a shut off for the gas, as well as one on the tank. It lights instantly, does not make any noise, is extremely lightweight, and the handle remains cold.

Torticollis

During the past 18 years or so I have had occasion to treat a few cases of torticollis in young foals. I have reference to those cases of unknown origin that occur when the foal is anywhere from one to three or four months of age; not those delivered with a wryneck. The past four or five presented at the hospital have all been thoroughly and carefully *x*-rayed under general anesthesia with failure to find any of the cervical vertebrae out of joint or fractured. One day, while reading the *American Medical Journal*, I read of the use of

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®[6]Davis & Geck, Inc., Danbury, Conn.
®[7]Aeroplast Corp., Dayton, Ohio.
®[8]Chas. Pfizer Co., Brooklyn, N. Y.

procaine solution in similar cases in man. The author (now unknown) attributed such cases to trauma with a subsequent severe unilateral spastic condition of the cervical musculature particularly the multifidus cervicis and intertransversales muscles. His use of 2% procaine solution relaxed and gradually straightened out the neck.

The next case presented was by consultation with a neighboring practitioner. We decided to infiltrate 2% procaine solution all along the concave (spastic) side of the cervical area, and massage it in well. Some improvement was immediately apparent. The treatment was administered once daily for five days. Each day the foal showed a greater tendency to return to normal until by the fifth day it could extend its head and neck normally. The second case took seven days but responded equally well. Hyaluronidase was used in the procaine injected in the second case. Why relaxation occurs with procaine and not general anesthesia I cannot say.

Future Trends

Almost daily newer and better tools are becoming available to the practitioner in the form of instruments and drugs. Some, of necessity are expensive, others not so much so. One such instrument is the *beta* ray applicator for treating superficial neoplasms on the surface of the eye. Such an instrument costs about $400. and will only be needed on relatively rare occasions. It would seem to me to be reasonable for several practitioners to purchase one applicator on shares, and have it available for all to use. In that way no one would have too much capital tied up in a seldom used instrument.

Of considerable interest to us at the moment is the development of the use of piperazine as an ascaricide. Proctor[2] has reported on its use in horses and recently The Upjohn Company has introduced parvex®, a piperazine compound. No doubt it has great possibilities for replacing carbon bisulfide in the treatment of ascarids. Trials with parvex (betaine of 1-piperazine carbodithioic acid) indicate it is also effective against Gastrophilus larvae. At the present time, we are running a clinical survey on the use of this preparation in horses.

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The Blood Picture of 200 Thoroughbreds

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In an effort to establish blood normals in Thoroughbreds samples were examined from 57 yearlings, 114 two, three, four and five-year-olds in training, and 29 samples from brood mares and stallions.

	Low	High	Mean
Yearlings-57			
R.B.C.	5,520,000	15,900,000	11,936,000
Hemoglobin	8.8 gm.	19.5gm.	14.0 gm.
W.B.C.	5,300	20,350	10,530
Differential:			
Neutrophiles	19%	53%	33%
Basophiles	0	2	1
Eosinophiles	1	30	7
Stabs	1	8	3
Monocytes	0	2	1
Lymphocytes	30	75	55
Horses in Training-114			
R.B.C.	7,500,000	15,900,000	11,344,290
Hemoglobin	10.5 gm.	20.0 gm.	15.0 gm.
W.B.C.	5,950	19,350	10,286
Differential:			
Neutrophiles	5	73	42
Basophiles	0	1	1
Eosinophiles	1	26	4
Stabs	0	37	7
Monocytes	0	3	2
Lymphocytes	12	83	44
Others: Brood Mares and Stallions-29			
R.B.C.	8,000,000	14,700,000	10,900,500
Hemoglobin	11.5 gm.	18.5 gm.	14.8 gm.
W.B.C.	5,600	17,700	10,035
Differential:			
Neutrophiles	21%	60%	40%
Basophiles	0	1	1
Eosinophiles	1	18	7
Stabs	1	15	4
Monocytes	1	3	2
Lymphocytes	26	63	46
As a group-200 -All ages			
R.B.C.	5,520,000	15,900,000	11,449,170
Hemoglobin	8.8 gm.	20.0 gm.	14.7 gm.
W.B.C.	5,300	20,350	10,319
Differential:			
Neutrophiles	5	73	39
Basophiles	0	1	1
Eosinophiles	1	30	6
Stabs	1	37	5
Monocytes	1	3	2
Lymphocytes	12	83	47

Many cases no doubt represented animals with clinical symptoms that were not normal, thereby making a blood study desirable. The figures give an interesting overall picture, however, of a random sampling of blood of the Thoroughbred.

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The Past, Present, And Future Of Systemic Parasiticides†

R. D. RADELEFF,* D.V.M. and GEORGE T. WOODARD,* D.V.M.,
Kerrville, Texas

AN intriguing concept of parasite control is that of attacking the offending organism in an indirect manner. Such an attack is based on the administration of a chemical, orally or parenterally, followed by absorption into the blood and transport to all parts of the body, there to be available to feeding parasites. For brevity, compounds used in this manner are referred to as systemic parasiticides.

The Past

A search for such systemically-active compounds, particularly insecticides, has been in progress for many years and has been intensive for the past 30. The method is also adaptable to plants, the compounds being distributed over the entire plant by the sap following application to leaves, roots, or seed.

Success has been achieved, both in plant and animal research. The most encouraging results in the control of livestock ectoparasites by this method were published in 1950 by A. A. de Toledo and H. F. G. Sauer[12] who were successful in the control of *Dermatobia hominis* in cattle and of carcass-breeding flies when the animals had been treated appropriately with certain chlorinated hydrocarbon insecticides. Before that report were those of others[1,2,3,4,5,6,10,11] concerning the control of horn flies with phenothiazine and the control of certain bloodsucking parasites.

The Present

Following the lead of de Toledo and Sauer, the USDA laboratory at Kerrville, Texas, began studying chlorinated hydrocarbon insecticides as systemics against cattle grubs, screw-worms, stable flies, and horn flies. Others at the Entomology Research Branch laboratory at Corvallis, Oregon, studied the effects of these compounds on horse flies, deer flies, and mosquitoes.

At Kerrville and Corvallis, aldrin, dieldrin and lindane were remarkably effective[7,9] but left an undesirable residue in the fat of the treated animals. The residue was undesirable because of its magnitude and its persistence in the tissues after treatment was suspended. Dieldrin and aldrin were outstanding on both counts. Lindane left a high residue but by comparison was eliminated rapidly. Six months or more are required to eliminate even low residues of aldrin and dieldrin while residues as high as 100 parts per million of lindane are eliminated in about two months. The residues left by either of these three compounds and the persistence of them make indiscriminate use of them impossible.

Because it is generally accepted that the organic phosphorus insecticides are readily eliminated and do not leave residues in the tissues, some of the members of the group were studied at Kerrville[8]. Diazinon, dipterex, and chlorthion were each effective to some degree or other, but none of them was either effective enough or persistent enough to offer an advantage over the presently used methods. Many other members of the group have been studied and found either too toxic or ineffective.

In 1954 Schwartz *et al.*[13] reported that low level feeding of phenothiazine to cattle resulted in some control of the cattle grub. Tests presently being conducted over the country should elucidate the question of whether this would be effective in reducing the grub population over a period of years. No claims for complete control were made by those workers.

Because of the requirements that no residues be present in meat and milk there are no compounds, with the possible exception of phenothiazine, that offer an advantage in control over the presently accepted methods and that could be used on a completely unrestricted

†Presented at the 38th Annual Convention of the Southern Veterinary Medical Association and Florida State Veterinary Medical Association, Jacksonville, Florida, Oct. 16-19, 1955.

*Animal Disease and Parasite Research Branch, Agricultural Research Service, U. S. Department of Agriculture.

basis. We do know, however, that systemic parasiticides are realities although they have not been developed to the point of unrestricted usage.

The Future

Should we find chemicals that meet the criteria of safety to the treated animal and to the consumer of the animal or animal products we will need to pass other criteria. At present there are numerous parasiticides available for treatment of livestock, including DDT, BHC, toxaphene, chlordane, rotenone, pyrethrins, methoxychlor, phenothiazine, and sodium fluoride, together with many less familiar. These compounds are relatively inexpensive, economical to use and give good control of a wide variety of parasites, many for several weeks after treatment. None of the methods of application require highly trained personnel.

Because of their probable toxicity, systemically-active injectable compounds will need to be administered by reasonably qualified persons with due attention being paid to asepsis, weight, and health. Because both skilled and unskilled labor would be involved and because labor costs are a major factor in livestock production, the additional costs must be justified by some increased benefit in production exceeding that obtained by regular methods. The increased benefit might be longer action, better parasite control or control of a parasite not otherwise controllable. Should low-level feeding of chemicals prove satisfactory then the foregoing advantages might not need to be shown.

To obtain longer action than is presently available either low-level feeding must be practiced or some method must be developed which will, by injection or otherwise, establish a slowly absorbed deposit of the chemical. The presence of such a deposit, regardless of whether or not it creates a residue in other parts of the body, could be hazardous to human health should the animal bearing it be slaughtered and that portion consumed. More immediate considerations are the local tissue reaction to the deposit and the mechanics of administration, since large doses probably will be needed.

Administration of single, large, oral doses would eliminate most of the problems associated with administration but would require new concepts in therapy if slow absorption over a period of weeks from the gastrointestinal tract is required.

Low-level feeding in salt or feed presents problems of erratic, indefinite, and constantly varying consumption with resultant erratic and incomplete control. Other problems of stability while openly exposed and compatibility with the vehicle will have to be solved. When chemicals are administered in such a manner their toxicity to wild animals and to several species of livestock must be well understood, unless the parasiticide is toxicologically inert. The possible damage to the animal by continuous low-level feeding must be considered.

It is probable that more complete parasite control would result if the other requirements could be met. The presence of the parasiticide in all parts of the animal at the same moment should minimize the number of failures to obtain complete control.

For some of the fast-feeding, bloodsucking diptera, such as the tabanids and deer flies, insecticidal blood may offer the only possible means of control. Sprays and dips have offered little control of these pests in the past.

Cattle grubs can be killed by sprays and dips of rotenone and by many systemic insecticides, but only after the larvae have cut their breathing holes in the skin. Considerable damage to the skin is done before the grub perishes, leaving a scar which is undesirable in leather. Some of our tests revealed that the damage was minimal, the scar being small and probably not seriously detrimental to the strength of leather that might be produced from the hides.

Grubs spend a considerable portion of their life-cycle within the body of the host before cutting through on the back. For several months an entire crop of grubs lies in the deeper tissues. If a chemical can be found that will destroy the larvae during that period, then a single treatment might suffice to eliminate the entire crop, consuming a minimum of time and labor. Many parasitologists feel that a successful attack upon the larvae of this pest at this stage would justify all expenditures made in the continuing study of systemically active parasiticides.

The future is not entirely dark. Indiscriminate, widespread use of most of the presently available compounds can not be tolerated because of the possible hazard to human health. This much must be accepted by all interested parties. However, most farm animals, when the total animal population is considered, are neither intended for slaughter or used in the production of milk for human consumption. Many species such as the dog, cat, and horse are not, under normal circumstances, food animals. The applicability of these treatments

to selected animals in these groups as therapeutic measures under their responsibility should be explored by veterinarians. We feel that thorough exploration of this field is being neglected by the profession, largely because the limitations on indiscriminate lay usage have been emphasized frequently and the therapeutic value for individual animals seldom mentioned.

Many applications should be found. Mange is an outstanding example, particularly in small animals such as the dog and cat. Most of the internal parasites may be attacked eventually in this manner, as indeed some are now attacked with low-level phenothiazine feeding, eliminating the failures due to excessive intestinal contents or the presence of incompatible substances. Such usages will not come to us; we must develop and understand them.

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Urea in Cattle Feeds†

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Protein and energy deficiency are the nutritional deficiencies most often observed in cattle feeding. Of these, protein deficiency is often the most difficult to correct because of the economics of the high protein feeds. The perennial shortage of protein has led to the utilization of non-protein nitrogen sources, such as urea and ammonium compounds, in ruminant feeding.

The Germans under the stress of World War I, initiated research which led to the utilization of urea in ruminant feeds. Work was done in this country demonstrating the usefullness of urea but it was not until World War II that urea became a common ingredient of ruminant feeds.

Today the use of urea is widespread and although growth and weight gains on urea-containing rations generally have been somewhat less than when all of the protein supplied came from oil seed meals, high priced oil seed meals and reduced cost urea, together with cheap carbohydrates (such as molasses), has changed the question from "Can I use urea?" to "How much can I use safely?"

In the motion picture you will see today we have emphasized the proper use of urea and the hazard of too much of this ingredient. Before showing the film I want to present some figures which emphasize the problem which faces the feeder and you as veterinarians advising him.

Urea is not protein. However, bacteria of the rumen can convert urea into bacterial protein which in turn can be digested and used by the ruminant. The bacterial flora has to be adapted to urea as a source of nitrogen. It takes a while to adapt the rumen bacteria and until adapted the animal is much more susceptible to urea poisoning than after adaptation.

Specifically: 100 gm. of urea in a single feeding will kill a 1000-lb. cow which previously has not been fed urea.

100 gm. of urea in two feedings of 50 gm. each is a safe level.

(*Continued on page 162*)

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†Presented at the 38th Annual Convention of the Southern Veterinary Medical Association and Florida State Veterinary Medical Association, Jacksonville, Florida, Oct. 16-19, 1955.

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Fluid And Electrolyte Balance In Surgery†

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ONE of the greatest hazards to successful surgery is a reduction in blood volume. This may be due to excessive hemorrhage, to loss of volume through vascular collapse, or the loss of fluid from the vascular bed by osmosis with resulting hemoconcentration.

Loss of blood volume by hemorrhage can and must be corrected by the administration of whole blood. In conditions where erythrocytes are not needed plasma or one of the plasma expanders may be employed.

During the past few years concerted effort has been made to develop a satisfactory blood plasma expander. Among the many substances tried are: Gelatin, a water soluble vegetable extract[1], dextran, and polyvinylpyrrolidone.

The two most widely accepted plasma volume expanders are dextran and polyvinylpyrrolidone better known as P.V.P. Dextran is derived from beet sugar. The native dextran is refined by bacterial action and fractional hydrolysis. The molecular weight is adjusted to roughly that of plasma[2]. The original work with dextran was done in Sweden, but the material used was found to be toxic and pyrogenic. These two factors have been eliminated in the dextran of American manufacture.

Commercially available solutions of dextran present many advantages for clinical use over the other plasma volume expanders. Dextran is suitable for storage and thus readily available for emergency use. Environmental temperature does not produce changes such as solidification experienced with some gelatin solutions. The material is non-toxic and can be metabolized for nutrition to some extent.

Polyvinylpyrrolidone, or P.V.P., is entirely a synthetic product. It was originally synthesized in Germany from acteylene[3]. It was used in Germany during the last war in the treatment of both military and civilian casualties. P.V.P. restores blood volume rapidly, is stable at a wide temperature range, is chemically uniform and metabolically inert, is inexpensive and easily produced.

In addition to blood volume the surgeon must be careful to maintain postoperatively a favorable electrolyte balance in his patient. Knowledge of a few physiologic facts about fluid therapy may serve the clinician in good stead in his approach to diagnosis and treatment of electrolyte disorder.

When an electric current is passed through a solution of a compound some elements dissociate into charged particles or ions. Electronegative or acid ions migrate to the positive pole and are called anions; the electropositive or base ions migrate to the negative cathode and are termed cations.

The old method of designating blood electrolytes in terms of milligram per hundred milliliters is not adequate for proper understanding of the balance of the acid and basic electrolytes. Electrolyte balance assumes more meaning when the concentrations are expressed in milli-equivalents per liter. Substances do not react in proportion to their equivalent weights. A simple example of this is sodium chloride. Twenty-three grams of sodium will react with 35.5 gm. of chlorine to yield 58.5 gm. of sodium chloride. Thus one equivalent of sodium reacts with one equivalent of chlorine.

The following formula can be used to change milligrams per 100 ml. to milli-equivalents per liter:

$$\text{mEq/L.} = \frac{\text{Mg./100ml. x 10 x valence}}{\text{atomic weight}}$$

Another method is the use of a conversion factor which is used to multiply the concentration in grams. This is probably the simpler method. Some of the conversion factors are: Sodium .435; potassium .256; calcium .498; magnesium .823; chloride .282; phosphorus .580.

The electrolytes included in intracellular fluid are potassium, magnesium, and sodium as cations, and phospate, sulphate, bicarbonate, and protein as anions. Extra cellular fluid, which can be divided into intravascular and interstitial fluid, is similar except for the pro-

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†Presented at the 38th annual convention of the Southern-Florida State Veterinary Medical Associations, Jacksonville, Florida, Oct. 16-19, 1955.

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tein content. It contains sodium, potassium, calcium, and magnesium as cations; and chloride, bicarbonate, phosphate, sulphate, organic acid, and proteins as anions.

A deficit in sodium may occur in gastrointestinal upsets or by excessive loss in the urine due to adrenocortical insufficiency which affects the kidney's resorptive function. Excess sodium in the tissues may hold water and cause tissue edema.

Chloride is the primary anion of extracellular fluid and for balance study purposes may be considered entirely an extracellular electrolyte. Chloride is closely linked to sodium as the two are generally ingested together. It is most rapidly excreted as a potassium salt.

Hypochloremia will most commonly be observed in extreme cases of nausea and may be treated by the administration of sodium chloride or potassium chloride solutions.

Potassium is the chief intracellular cation. The symptoms of potassium deficiency include muscular weakness particularly of the respiratory muscles. Perhaps of more importance is the cardiac weakness and hypotension which may not be noticed until congestive heart failure develops.

Cannon[3] found that potassium plays an important role in protein repletion. Without adequate potassium experimental animals failed to repair depleted tissues even with ample supplies of amino acids available.

Magnesium is found in all cells and body fluids, but chiefly in muscle and bone. A deficit of magnesium is indicated by hyperexcitability progressing to tetany.

Phosphate is important in intracellular metabolism. It plays a part in phosphorylation of glucose and the movement of potassium into the cells.

The kidney is the most important body organ in the physiology of electrolytes and water. The two functional units of the kidney are the glomeruli and the tubules. The glomerulus is simply a capillary mass which filters about 25% of the cardiac daily output. Glomerular filtration removes urea, phosphate, sulfates and organic acids from the blood.

A degeneration of the kidney tubules designated as lower nephron nephrosis has been described by Rice, Strickler, Fernandez and Lufkin[4]. They associate this nephrosis with electrolyte imbalance. Their preliminary report covered approximately 20 human cases which had undergone surgery and later came to autopsy. In an examination of their data they found the blood urea nitrogen markedly elevated in the patients presenting the greatest degree of tubular degeneration. This is probably an index of kidney inability to function.

Blood sugar values were elevated in all cases, but there seemed to be no correlation between the degree of tubular damage to the severity of electrolyte imbalance.

Therefore, renal function is an important point. If renal function is poor, it may be dangerous to provide large quantities of fluid intravenously. For example, it would be foolhardy to give excessive amounts of water and potassium in the presence of anuria. In such cases small quantities of fluids can be given to compensate for so-called insensible loss and the loss in the stools.

The development of protein solutions to supply the necessary amino acids required for repair of tissues has been a great help in patients unable to receive nutrients orally. A low protein level will not only retard wound healing but predisposes the patient to pulmonary edema, infection, and impaired liver function. Nitrogen loss is exaggerated following surgery; therefore, the administration of protein solutions will help maintain a positive nitrogen balance.

Amino acids are needed by the body for the formation of great many types of protein. An adequate supply of amino acids for the formation of plasma protein will aid materially in permanent restoration of blood volume following severe hemorrhage. These plasma proteins aid in maintaining the integrity of the circulation and controlling fluid interchange across the capillary wall.

Summary

Successful surgery requires the maintenance of adequate plasma volume. This can best be accomplished by use of whole blood, plasma, or a plasma expander.

Patients unable to receive adequate nourishment orally can be fed parenterally with all the necessary nutrients.

An imbalance of electrolytes will interfere with the efficient use of available nutrients, produce pathologic changes in body organs and retard wound healing.

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Repair of Urinary Bladders in Steers

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Urinary calculi appears to be a common problem wherever beef cattle are raised. Obstruction of the urethra is followed by fairly definite sequence of symptoms so that diagnosis is usually not difficult. Manifestations of colic, an elevated tail, contractions of the anal sphincter and accelerator urinae muscles are suggestive. When these symptoms are demonstrated a routine urethrotomy permits favorable prognosis. However, if relief is not provided in time, some portion of the urinary passage may separate under the pressure and irritation of the urine. When the urethra necroses, urine is permitted to escape into the tissues around the penis. Through gravitation this urine moves to the ventral abdomen where it may cause an edematous swelling or it may cavitate in the subcutis. It has been suggested that rough, irregular concretions cause urethal necrosis more rapidly than smooth ones. A urethrotomy performed on these cases permits a fair prognosis. If the edematous swelling is warm, resorption of the urine may take place. If the engorged tissues are cold to the touch, a variable amount of sloughing may be expected if the animal survives. Surgical drainage of the area may be helpful.

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Fig. 1. Paracentesis to remove the urine from the abdomen.

Fig. 2. The animal is suspended by the hind limbs.

If the urethra remains intact, the excessive pressure may result in urine escaping from the bladder into the abdominal cavity. This may result from several perforating areas of necrosis or by frank rupture of the bladder wall. Usually the rent or perforations are on the anterior hemisphere of the bladder. A routine urethrotomy of these animals must be attended by a poor prognosis. Occasionally there seems to be a spontaneous repair of the bladder. Frequently, however, the urine continues to accumulate in the abdomen until death from uremia occurs.

A review of the most recent 141 cases of urinary calculi presented to the clinic at Iowa State College suggests the proportion of the three general classifications:

Urinary tract intact	— 76
Urethra ruptured	— 36
Bladder ruptured	— 29

The death loss of the last group exceeded the loss from the combined first two groups. This would seem to be a higher percentage of advanced cases than would be observed in field practice.

Recently, in the cases presenting a ruptured bladder, the defect has been closed surgically with encouraging results.

Operative Procedures

The initial procedure is to perform a paracentesis to remove urine from the abdominal cavity. Then an ischial urethrotomy is performed. The animal then is elevated by the hind quarters with a block and tackle so that only the head and withers are resting on the ground. Procaine (2-4%) is infiltrated along the proposed line of incision just anterior to the brim of the pelvis and just lateral to the penis. An incision long enough to admit the operator's hand is made through the skin and abdominal wall. In some instances the flaccid bladder is easily brought to the outside where

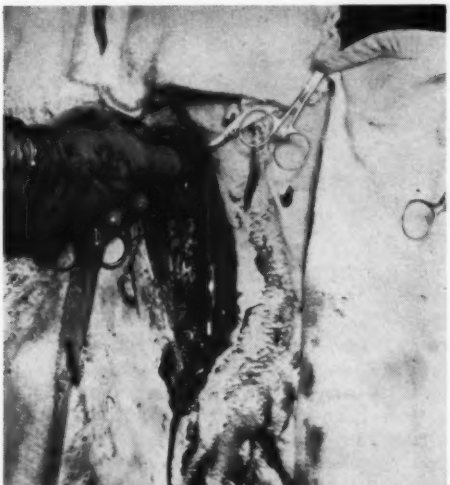

Fig. 3. The urinary bladder is brought to the abdominal opening.

Fig. 4. The rent is being sutured.

Fig. 5. The peritoneum and musculature are closed with a continuous suture with catgut.

it may be repaired. If, however, the bladder is in a state of contraction, considerable tension may be necessary to bring the fundus through the surgical opening.

The necrotic edges of the rent or perforations are removed with scissors and one or two rows of infolding catgut sutures are used. The abdominal wound is closed with no. 4 catgut including the musculature and peritoneum together. The skin is closed separately.

These animals usually are toxic and restraint is not difficult. The operation is relatively simple and requires little time to complete.

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The word "apothecary" is derived from ancient Greek and means literally "storehouse."

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Fluid Balance

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Digestive Disturbances In Cattle†

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IN this paper a group of common disturbances of the bovine gastrointestinal tract will be discussed from the clinicians point of view.

That part of the digestive tract that is probably over-looked most often is the mouth. If at any time a cow is off feed for any reason however obvious, the mouth, including teeth, gums, lips, tongue, cheeks, and palate should be examined. The basic ration of this species is roughage and unless all parts of the mouth are functioning properly such food is not prepared properly for digestion.

Common symptoms observed in the mouth are: Drooling of saliva, dropping of cuds, failure to chew, standing with head turned sideways, lolling of tongue, and unthriftiness when there is evidence of plenty of feed.

The common causes of the above symptoms are: (1) Formation of enamel points due to defective teeth or malformation of the jaw. These points are found on the labial or buccal edge of the upper teeth and lingual edge of the lower teeth. Treatment is simply floating edges to cut down points, being careful not to remove the normal ridges of enamel.

(2) The persistence of the deciduous teeth (particularly molars) so that a cap remains which interferes with mastication and leaves an avenue of infection to the gums. Most caps are easily removed with forceps or in some cases with an elevator.

(3) Split teeth. These of course must be removed by extraction.

(4) Fractures of the mandible. Reduction of mandibular fractures in cattle have not been good, particularly where there is displacement. Unless the animal is a valuable specimen slaughter is recommended.

(5) Foreign objects penetrating lips, gums, tongue, and palate. Treatment here is obvious; removal of the object and treatment as indicated for wounds.

(6) Actinomycosis and actinobacillosis. Our treatment is an iodine compound in the feed and antibiotics, usually penicillin for ten days to two weeks duration.

(7) Mycotic stomatitis. Observations indicate that this fungus infection occurs most frequently after rainy seasons. Plant fungus is believed to be the etiological factor. Symptoms are drooling, lolling of the tongue, standing with mouth open, grunting, evidence of severe pain, loss of weight, and difficult walking (resembles founder in some cases, others show no difficulty in walking). On examination of early cases, blister formations are observed on the dental pad, lingual surface of the gums, muzzle, tongue, and the commissures of the lips. This is followed by erosion and sloughing of these areas. Sometimes similar lesions are seen on teats and around the fetlocks, particularly below the dew claws on rear legs. Usually only one or two such cases occur in a herd. Treatment begins with injections of 2,000,000 to 3,000,000 units of penicillin for secondary infection and application of dilute acetic acid directly to lesions two to three times daily. Apple cider vinegar with added vegetable dyes are dispensed for this schedule. Treatment usually requires from four to six days.

(8) Loss of all incisors. This is observed particularly in well established beef breeding herds among aged cows. Beef animals in Georgia subsist almost completely upon grazing. Routine checks of the mouths of all aged cows that are showing more loss of weight than younger cows in the same herds is a regular practice. In some cases, the owner may think that securing another calf from a particular individual is worth putting the animal on ground feed. We find these animals will maintain their weight surprisingly well if hand fed.

Bloat

In our practice, bloat is classifed by apparent cause into three groups: Green or acute, observed in cows grazing on clover, alfalfa, or other legume pastures. Treatment includes the use of silicones such as tympanol,®[1] either by injection into the rumen through the flank or

†Presented at the 83rd annual convention of the Southern-Florida State Veterinary Medical Associations, Jacksonville, Florida, Oct. 16-19, 1955.

®[1]Jensen-Salsbery Laboratories, Kansas City, Mo.

by stomach tube. Sometimes passage of the stomach tube will relieve the acute condition but most often the contents of the rumen are too frothy, with gas mixed with rumen contents and little free gas present in the dome. Prevention is proper management including feeding of dry roughage before grazing legumes, controlling length of grazing time, and waiting until moisture is dried before grazing. We always caution owners or managers to check cows frequently up to two hours after removing from grazing. We have several clients now that cut all legumes for lot feeding rather than allow animals to graze these plants. The trochar is used only as a last resort.

Dry bloat designates for us that due to sudden changes in diet, choke, or poor grades of roughage during dry seasons. If it is due to choke, of course we remove the object. In our practice choke is due generally to nubbins of corn, pears, apples, or watermelon rind. Passage of a stomach tube usually suffices to push the object on into the rumen. In cases of bloat due to overeating or sudden changes in diet or poor roughage, we pass the stomach tube, which relieves the bloat as the gas is usually free above the rumen mass. One pound of a milk of magnesia preparation such as rumide®[3], dissolved in at least 2 gal. of water is pumped into the rumen by way of the stomach tube. Tartar emetic and nux vomica are dispensed as follow-up treatment. In some cases of impacted rumens due to over eating, we find that 200 to 500 cc. of a calcium preparation given intravenously is useful as supportive treatment.

In cases of overeating grains such as wheat, rumenotomy may be necessary. Our procedure is to give rumide by stomach tube first. If recovery is not apparent within 24 hours rumenotomy is performed routinely with a minimum of hazard. Recoveries are the rule.

Operative Technic for Rumenotomy

Clip the left flank area closely, scrub well with phisohex®[6] rinse, apply alcohol, and paint with ticture of metaphen®[4] and drape. We use 2% procaine along the line of incision. After incising the abdominal wall, grasp the rumen and bring into incision, then clamp with four towel clamps (two on each side.) These clamps are held by two assistants. The next step is the incision into the rumen and placing a hoop shroud. The remainder of the operation consists of removing excess grain or other material. We always check the reticulum for foreign objects while in the rumen. Rumen is closed with two rows of no. 3 or 4 chromic catgut, using modified Lembert sutures. At this point, we put 300 to 500 cc. of sulfatose®[5] in the abdominal cavity, then suture the peritoneum and muscle layers with no. 3 chromic gut and the skin with mattress sutures of umbilical tape. If any penetrating foreign object was found in the reticulum, we keep the animal on penicillin for three days. There are probably some cases that if given more time might have recovered without surgery. We feel however that prompt surgery is followed by best results.

Chronic bloat designates a third common type. By chronic bloat we refer to those cases that recur due to interference with or a lack of normal rumen flora. This condition has been observed particularly in calves that have been given an excess of antibiotics or sulfonamides as a treatment for scours or pneumonia. Treatment here is to relieve that bloat by passing a stomach tube, then administering rumen cultures. A number of commercial preparations are available, but we still prefer fresh fluid from a normal cow's rumen. Whenever available on the farm, fresh fluid is collected and given, otherwise one of the commercial preparations is used.

Traumatic Gastritis

Books and numerous papers have been written on foreign bodies in the reticulum. When we see a cow showing some of the usual symptoms; such as sudden and marked loss of appetite, drop in milk flow, vomition, arched back, stiff walking, depression, abduction of the elbow, atony of the rumen, and pain on palpation over the area of the reticulum, a calcium test is run on the urine. If the urine shows plenty of calcium, we look for some other cause of trouble. If the urine test is negative, it is not pathognomonic, but just another piece of evidence pointing toward a foreign body. Surgery is performed without delay employing techic as outlined in the foregoing for rumentomy. If doubt exists, 1 lb. of rumide is given by way of stomach tube and the cow examined again in 24 hours. If not improved surgery is recommended. If any abnormal heart sounds are evident or there is any swelling or edema of the brisket area, surgery is not recommended. Prognosis in these cases is grave and does not warrant the expense of

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®[3]Pitman-Moore Co., Indianapolis, Ind.
®[4]Abbott Laboratories, North Chicago, Ill.
®[5]Norden Laboratories, Lincoln, Nebr.
®[6]Winthrop Laboratories, Inc., New York, N. Y.

surgery. However, we have an occasional case that will develope edema of the brisket two to four weeks following apparent recovery from rumenotomy. We feel that this is most often due to abscesses of the liver and we have obtained good results by giving injections of penicillin and streptomycin twice daily for seven days. Fatal pericarditis is always a possibility in these cases.

Indigestion

Occasionally we are called to treat a cow four to five days after calving. Condition observed is due to ingestion of fetal membranes. The majority of these cases recover following administration of one pound of rumide. Rumen cultures are also indicated to hasten recovery. We always suspect this in any cases of rumen atony that occur within a few days after calving.

In our section of Georgia we see occasionally cows with sand colic. This is usually due to drinking from shallow creeks with sandy bottoms. We have not been able to differentiate indigestion due to sand from simple atony of the rumen due to changes in feed, et cetera, but have had to rely on case history and our own knowledge of the client's farm and streams. For example, sand colic occurs on two farms in our practice area fairly often. Our treatment is administration of 1 to 1.5 gal. of mineral oil *via* stomach tube. If improvement is not effected within 24 hours rumenotomy is performed.

Blackleg and Associated Infections

We practice in an endemic area of blackleg, or clostridial infections, and observe cases that are difficult to differentiate clinically from severe impactions. Affected animals are dull, depressed, exhibit complete anorexia, muscular tremors, slight bloat, hard doughy rumen, and evidence of pain on palpation over the abdomen. Early stage is characterized by temperature elevation to 104 to 106 F. but this falls quickly to below normal. On postmortem, a severe peritonitis is revealed with excess fluids and fibrinous exudates. We consider the infection due to *Cl. septicus.* The condition occurs frequently in herds that have been vaccinated by the owner using only *Cl. chauvei* bacterin. It has not been diagnosed in animals that have been vaccinated with *Cl. chauvei* and *Cl. septicus* bacterin. If affected animals are still showing a temperature reaction and are up when observed, we attempt treatment using 200 to 500 cc. of sulfatose injected directly into the abdominal cavity and large doses of penicillin. However, if the animal is showing a subnormal temperature or is down, no attempt is made to treat.

Heavy Metals Poisoning

I believe that in our area there have been as many dollars worth of cows killed by arsenic as dollars worth of cotton saved. We have seen so many cases of arsenic poisoning that we are truly arsenic conscious. In one summer a total of 126 cases were observed. Fortunately, a number of newer insecticides are being used to spray cotton now instead of arsenic, but quite a few of our older cotton farmers feel that nothing can beat syrup and arsenic as a bollweevil killer. Even on farms that have discontinued the use of arsenic there is nearly always some that has been stuck back somewhere and forgotton. Symptoms observed usually become apparent two to five days after ingestion. Generally these are primarily incoordination accompanied by severe gastroenteritis with a fetid diarrhea. Nearly all owners, when given a diagnosis of arsenic poison, deny the possibility of the cow having eaten arsenic, but when the premises are checked source is revealed. Our treatment is 1 gal. of rumide via stomach tube followed by intestinal astringent such as I.A.T.®[5] tablets every six hours. When cattle prices were high, we used a lot of British antilewisite (BAL) with what we thought were good results, but frankly the price of grade cows now will not support its usage. Our dosage of BAL is 9 cc. per 1000-lb. cow given intramuscularly at four-hour intervals for two days, then at longer intervals depending on the patient for another two to three days. There should not be over 3 cc. given in any one site to prevent abscess formation. When economics will permit, we use BAL in addition to treatment given above. In arsenic poison cases, if the cow is still on her feet, treatment is recommended but if the animal is down, the owner is advised that prognosis is unfavorable. Euthanasia is recommended.

We see an occasional case of mercury poisoning, usually as a result of eating grains treated with cerusan ®[6]. Symptoms are similar to those of arsenic; however, the owner usually knows about the cerusan. Treatment is the same as for arsenic. I have about reached the conclusion that those saved just did not eat enough of the treated grain to kill. BAL might be given some of the credit.

®[5]Ft. Dodge Laboratories, Ft. Dodge, Ia.
®[6]Merck & Co., Rahway, N. J.

Lead poisoning is rare since paints are being made with casein and plastic bases. Symptoms observed are those of hemorrhagic gastroenteritis and cerebral abnormalities. Our treatment is magnesium sulfate by mouth, atropine sulfate, gr. ¼ subcutaneously and havidote®[7] intravenously. We also give I.A.T. tablets by mouth.

Intestinal Parasites

No discussion could be given on digestive disturbances of cattle without mention of internal parasites. Symptoms are well known, but treatment methods vary widely. Phenothiazine drenches given individually are recommended by us. Afterwards, owners put all young dairy stock on a 1: 12 phenothiazine-salt mixture free choice. This mixture is also recommended for beef herds. Phenothiazine is purchased in bulk and packaged in 8-lb. bags for mixture with 100 lb. of no. 4 salt. This is an excellent dispensing item and a competitive one.

Fecal flotations are run on cases of diarrhea showing blood. If coccidia are found, sulfamethazine is given *per os* for four days with astringents. If hemorrhage is severe klot®[8] intravenously is administered.

Intussusception

We have seen more cases of intussusception this year than in any previous two years. The reason is unknown. Onset is sudden and marked by complete anorexia and colic. Affected animals usually stand stretched out and tread with back feet, may lie down and get right back up. There is little if any bowel discharge, and after the second day only limited quantities are passed that are black and tarry. The intussusception can be palpated through the rectum. Treatment of course is surgery. Practically, if the case is observed early we recommend salvage by slaughter.

▾ ▾ ▾

Bigger Headaches

Aspirin continues to be one of the most important medicinal chemicals produced in terms of quantity, according to *Medical News*. Annual production rate, based on manufacturers' reports for the first six months of 1955, is approximately 8,000 tons, an increase of 11% over figures reported for 1954.

®[7]Haver-Glover Laboratories, Kansas City, Mo.
®[8]Warren-Teed Product Co., Columbus, Ohio.

Urea in Cattle Feeds

(*Continued from page 154*)

90-120 gm. per day is a recommended top level of urea feeding.

By increasing the level of intake gradually a 1000-lb. animal can be adapted to daily intakes of urea of as high as 300 gm. per day. Long continued use of high levels may cause kidney damage.

Cattle kept off feed for from 24-48 hr. are much more susceptible to urea toxicity than animals on a regular feeding schedule. In our experience from 1/3 to 1/2 the toxic dose for fed animals will kill such starved animals.

The bacterial flora change rapidly. In our experience cattle which have been receiving high levels of urea (up to 250 gm.) daily lose their adaptation in about three days and thereafter are as susceptible to urea poisoning as animals which never have had urea.

Acetic acid has been proposed as an antidote for acute urea toxicity and we have found it successful when applied quickly and in sufficient quantity. In our hands a gallon of 5% solution of acetic acid has saved animals suffering from acute urea poisoning caused by as much as 120 gm. of urea given at a single feeding. A gallon of cider vinegar is equally effective.

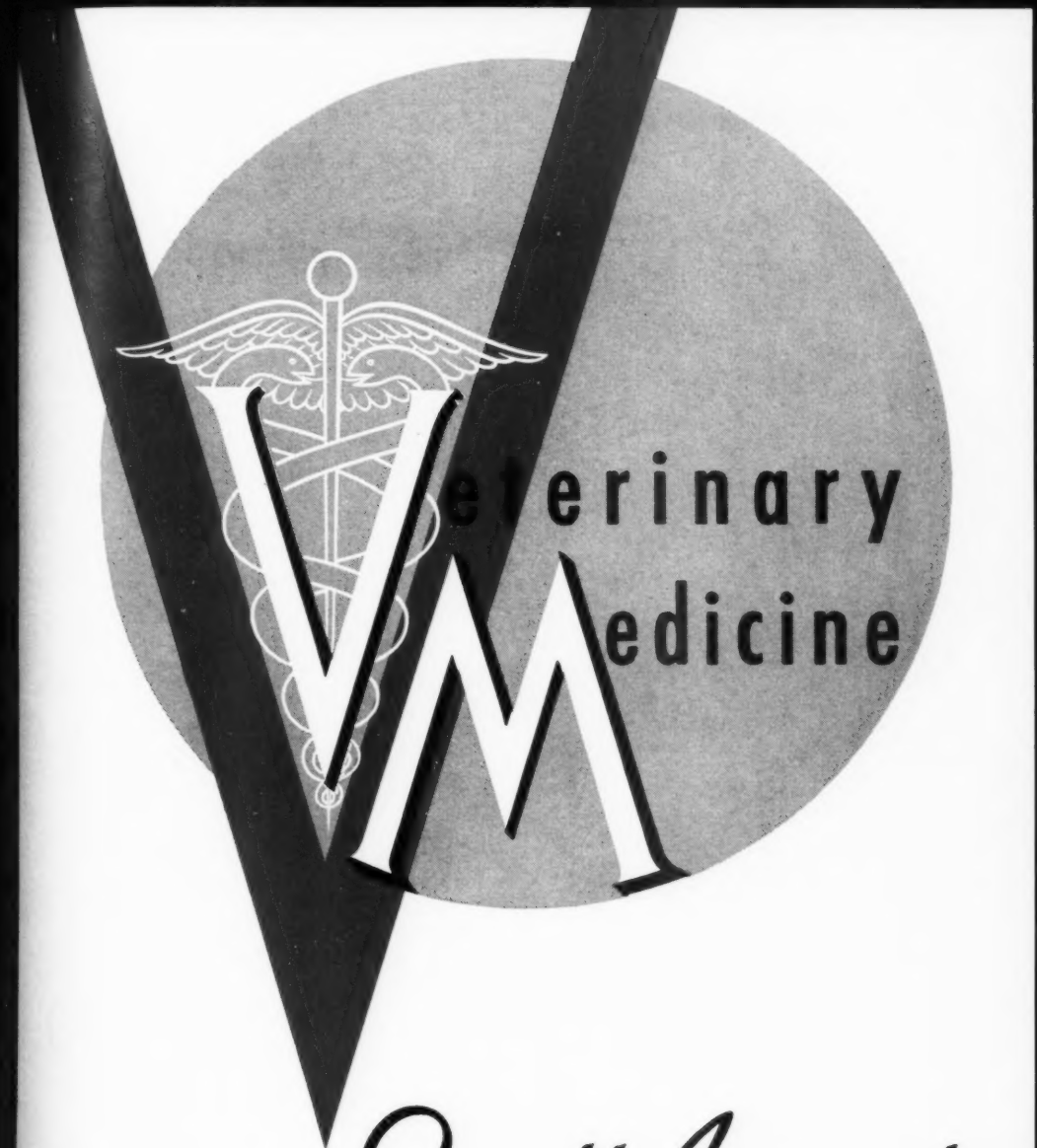
▾ ▾ ▾

Antibiotic Treatment of Semen a Practical Safeguard

In the bovine artificial insemination field, it has become virtually a uniform practice to add an antibiotic to the semen to control infections. The New York State Veterinary College at Cornell University reports that following the artificial insemination of 94 virgin heifers with antibiotic treated semen — the semen derived from Vibrio-infected bulls — vibriosis did not develop in any of the heifers. It is important that the semen be held for at least six hours following the addition of the antibiotic. It is contended, based on extensive general observations, that conception rate has been raised 10% in the first service basis as a result of this practice.

▾ ▾ ▾

More than 450,000,000 prescriptions were filled by pharmacies in the United States in 1955, according to reliable trade sources.



Small Animal

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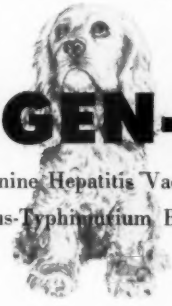

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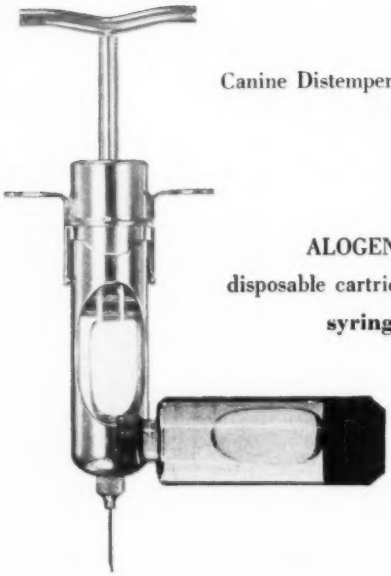

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Urinary Diseases Of Small Animals†

K. W. SMITH, D.V.M., Sioux City, Iowa

DISEASES of the urinary tract are common anomalies suffered by small animals. Estimates indicate that 10% of all dogs die from uremia; and in aged patients mortality due to urinary disorders is said to approach 50%. A high incidence of urinary disease occurs among domestic cats, although it is probably not as high as in dogs. These facts give indication of the importance of this group of diseases in small animal practice.

The urinary tract serves as one of the principal avenues for elimination of waste products. The kidneys remove nitrogenous waste, inorganic salts, water, and non volatile, soluble, foreign substances from the blood, which are then carried to the exterior by the excretory portion of the urinary tract. When these vital functions are impaired, resulting syndrome is known as uremia or the accumulation of urinary waste products in the circulating blood.

Not many years ago such terms as Stuttgart's disease, canine typhus, and hemorrhagic gastroenteritis were used to describe disease conditions observed in dogs about which little was known. Now these conditions are recognized as uremic syndromes usually resulting from kidney disease.

Uremia

Uremia *per se* is not conclusive evidence of disease of the urinary tract. It can result from cardiac disorders where insufficient blood is circulated through the kidneys to maintain normal kidney function, or from obstruction of renal arteries. In cases of extreme dehydration, uremia may develop when body fluids are depleted to such a degree that there is insufficient excretion of water to remove urinary waste from the blood. Food that contains too much poor quality protein leaves an excess of nitrogenous waste when metabolized. This is an important causative factor for uremia in cases where kidney function already is impaired.

Of all the causes for uremia, kidney disease is by far the most common. It is interesting to note that animals normally are provided with three to four times the amount of renal tissue necessary to carry on normal kidney function. It is apparent, therefore, that kidney damage has progressed to a rather advanced stage by the time symptoms of uremia are manifested.

Uremia may result from obstruction to the urinary excretory tract involving the urethra, bladder, or both ureters. Obstructions of the urethra and bladder are common, but bilateral blockage of the ureters is rare. Some examples of the usual types of lesions causing obstructive uremia are urethral calculi, disease of the prostate gland, retroflexion of the bladder, and traumatic injuries.

Although uremia is not a disease in itself, it is a symptom complex worthy of special description.

†Presented at the 38th Annual Convention of the Southern Veterinary Medical Association and Florida State Veterinary Medical Association, Jacksonville, Florida, Oct. 16-19, 1955.

®[1]Chas. Pfizer & Co., Brooklyn, N. Y.
®[2]Parke, Davis & Co., Detroit, Mich.
®[3]Lederle Laboratories, Pearl River, N. Y.

Clinically, two principal forms of uremia are observed: Acute and chronic. However, all the intermediate degrees of variation occur, making it difficult to draw a clear line of demarcation between them.

Acute Uremia

Acute uremia is characterized by sudden onset with loss of appetite and vomiting. Vomiting is of the persistent type and vomitus consists of a greenish, yellow fluid or it may contain blood. Thirst is intense, but water is vomited immediately. There may be either stasis of the bowels or diarrhea with an orange brown or bloody fecal material. Dehydration of body tissues is rapid and body temperature is either normal or subnormal. Blood vessels around the cornea of the eye are congested (pericorneal injection). In the final stages uremic spasms, affecting particularly the temporal muscles, are often present, and the temperature drops below normal. Prostration and death soon follow. The owner usually believes that someone has poisoned his pet or fed him ground glass.

A positive diagnosis can be made by the blood urea test. A normal of 20 to 40 mg. % may be found increased to as high as 300 mg. %. However, a diagnosis of uremia alone is insufficient. Cause must be determined before proper treatment can be initiated.

Chronic Uremia

Symptoms of chronic uremia are more variable than those of the acute form. They often develop so insidiously that determination of exact time of onset is difficult. First symptoms are usually those of general unthriftiness, rough hair coat, and failing health. Appetite is usually poor and there is a tendency toward digestive upsets. Pruritus, eczemous dermatitis, and arthritis are all symptoms that may be caused by chronic uremia. The mucous membranes are anemic, and there is a urinose odor from the mouth. The typical uremic mouth in more advanced cases is characterized by ulcers and loosening of teeth. Anything that disturbs the regular daily routine is likely to cause exacerbation of the uremic symptoms. Blood urea tests show readings of 50 or 60 mg. % or higher. Since practically all chronic uremia in dogs is caused by chronic interstitial nephritis, excessive thirst and the excretion of large volumes of watery urine are accompanying symptoms.

I will not attempt to describe all the urinary diseases of small animals but will include those that are of special clinical significance.

Nephritis

Nephritis is especially prevalent in both dogs and cats. Other kidney diseases that occur occasionally include: Pyelitis, lithiasis, nephroma, cystic kidney, and parasites. Nephritis affects all ages and both sexes, but is seen most frequently in middle aged and old male dogs.

Etiology. Causes of nephritis are numerous and varied. In carrying out their function of removing waste products from the blood, the kidneys are subjected to many forms of irritation such as toxins, poisons, catabolic products, microorganisms, and viruses. In addition, the kidneys are subject to ascending urinary infections and traumatic injuries.

Infections are probably the most frequent cause for nephritis. Leptospirosis, canine hepatitis, distemper, and numerous non-specific infections such as those resulting from invasion by Proteus and streptococci.

Chemical poisons, both organic and inorganic, are capable of causing nephritis, but little information is available regarding the incidence of such cases. A few examples of these poisons include turpentine, coal tar derivatives, mercurials, and phosphorus. Actually there are hundreds of poisonous substances that are capable of causing kidney damage.

Toxins originating from infections in other parts of the body are known to cause renal irritation. Examples are infected teeth, tonsils, et cetera. Also, excessive quantities of free hemoglobin in the blood resulting from rapid destruction of red blood cells may cause renal inflammatory reactions. Toxic products of tissue destruction, such as those originating from burns, are irritating to kidney tissues; thus, renal failure is a common complication in burns.

Chilling and fatigue are believed to help initiate clinical cases of nephritis. However, it is doubtful whether these are actual causes. Instead, it is probable that pre-existing subclinical nephritis is transformed into a more acute type.

The above group of etiological factors, while by no means exhaustive, will serve to illustrate the wide variety of causes for renal inflammation in small animals.

From the clinical view point, renal inflammation occurs as either acute nephritis or chronic nephritis.

®[4]Sharp & Dohme, Philadelphia, Pa.
®[5]Hill Packing Co., Topeka, Ks.

Acute Nephritis

Symptoms. Symptoms originate, for the most part, either from kidney pain or from renal insufficiency. The onset is often characterized by stiffness in the hind parts, reluctance to move, and abnormal arching of the back. There may be evidence of pain upon palpation over the kidney region, although pain and stiffness are not always present. Body temperature is either normal or moderately elevated in the early stages, normal or subnormal in late stages. When kidney function is disrupted to the point where urinous waste products accumulate in the blood, symptoms are principally those of acute uremia: Vomiting, inappetence, dehydration, uremic spasms, and prostration. Urine secretion is either reduced (oliguria) or suppressed entirely (anuria). The course of acute nephritis varies from two or three days to as long as a week or more.

Diagnosis. Diagnosis is based upon clinical symptoms in conjunction with urinalysis. The urine usually is reduced in quantity, highly colored, and often turbid. Specific gravity is normal or increased, albumen is abundant, tests for blood may be positive, and renal casts usually can be found.

Renal clearance tests give some indication as to the degree of kidney damage. Remember that 80% of the kidney tissue must be incapacitated before normal renal function is disrupted. Since most cases of acute nephritis already are showing symptoms of uremia when they are brought to the attention of the clinician, it is evident that kidney damage has progressed to such advanced degree by the time treatment is initiated that many cases fail to respond.

In making a differential diagnosis, acute nephritis must be differentiated from other uremic diseases and also from other diseases characterized by vomiting, such as foreign bodies and obstructions of the gastrointestinal tract. Nephritis also may be confused with acute toxemia such as the type that occurs in pyometra. In fact, the two may co-exist. Final diagnosis depends to a large degree upon urinalysis.

Treatment. When kidney function is reduced to the point where uremic symptoms appear, the situation is always serious and requires immediate and heroic treatment. Every effort must be made to re-establish as much kidney function as possible. Parenteral fluid is especially valuable because it not only helps stimulate diuresis, but it also combats the dehydration usually present and helps to control the

Courtesy Dr. Ole Rollag

Nephritis due to *Echerichia coli* infection

persistent vomiting. Either 5% dextrose in saline or 5% dextrose alone may be used. Where persistent vomiting has depleted chloride reserves, dextrose in saline is particularly valuable. If fluid therapy is continued, it is usually better to change to 5% dextrose alone because of the danger of chloride retention, a condition characterized by tissue edema or dropsy. Parenteral fluids may be given intravenously, subcutaneously, or intraperitoneally. When the intravenous route is used, care should be taken to avoid too rapid administration or excessive quantity at one time. There is danger of pulmonary edema and congestive heart failure from over filling of the vascular system. In the initial treatment, 50 to 150 cc. of fluid may be given intravenously by drip method and another 200 to 500 cc. by hypodermoclysis. As rapidly as the hypodermic fluid is absorbed, it should be replenished. In this way, the fluid is utilized as needed by the body without overtaxing the vascular system.

Hypertonic dextrose solution, given intravenously, has a pronounced diuretic effect, and may be found useful in overcoming anuria.

For this purpose, a 10% solution is recommended.

Procaine intravenously is receiving recognition as a means of increasing kidney function. Recommended is 2 to 10 cc. of a 1% solution administered slowly into the vein, and repeated at eight to 12 hour intervals. Procaine may be mixed with dextrose solution (0.2% procaine in 5% dextrose) and given by slow intravenous drip.

Heat applied to the kidney region is used to stimulate renal function in human medicine. Heat is applied either externally or by diathermy.

One of the few conditions where venesection is still advocated is for relief of severe uremic symptoms. Here it is said to be a life saving measure, lowering the blood level of nitrogenous waste products enough to prevent fatal termination until sufficient renal function can be reestablished.

Antibiotics are used routinely in the treatment of acute nephritis because infection is so frequently found either as the primary cause, or as a secondary invader. In uremic cases, only injectionable antibiotics are administered since vomiting precludes the use of oral medication. Penicillin is given in large, daily doses for a period of at least four or five days. Streptomycin given in conjunction with penicillin is effective in some cases that do not respond to penicillin alone. If the response to these antibiotics is inadequate, terramycin®[1], chloromycetin®[2] or aureomycin®[3] may be used.

Sulfonamides are contraindicated in cases of acute nephritis where renal function is impaired. Since sulfonamides are eliminated largely through the kidneys, they only add to renal embarrassment.

Other urinary antiseptics such as methenamine and mendelic acid are rather ineffective as compared to antibotics. These drugs still have a place during convalescence after antibiotic treatment has been terminated.

In order to relieve the burden from the kidneys, bowel elimination should be encouraged by the use of mild saline cathartics and low enemas.

Some of the newer antispasmodic drugs such as darstine®[4] may be helpful in controlling vomiting. These are given either orally or parenterally.

In cases of heart weakness, cardiac stimulants will greatly increase renal output. However, in acute renal inflammation, cardiac stimulants may be contraindicated.

All food and water must be withheld until vomiting has ceased. As soon as water can be retained, it should be supplied in maximum quantity.

After vomiting is under control, do not be too hasty in getting the patient back on feed. It is especially important to restrict the intake of protein foods at first. Milk and cereals, or other carbohydrates, usually are recommended in limited quantity at this time. However, a patient that has been losing albumen through the urine needs protein replacement as soon as possible. This should be supplied in a form that is easily utilized such as the proteins of milk and eggs. Proteins that are of low biological value are metabolized with an excess quantity of nitrogenous waste which places added burden on the kidneys. Special diets (prescription diets) developed by Morris for dogs with kidney disease (k.d.)®[6] have simplified greatly the feeding of the nephritic patient.

Vitamin B complex is given routinely as general supportive therapy. The injectable form is used during the stage of vomiting and oral administration during convalescence.

General care and nursing are important in the handling of acute nephritis. The animal should be kept at rest, and in a warm place out of drafts. Avoid over heating, chilling, and over exertion.

In cases where the kidneys are damaged extensively and blocked to such a degree that kidney function is completely disrupted, all methods of treatment may fail. Many cases are in such an advanced stage of uremia when brought to the veterinarian that treatment is hopeless.

Chronic Nephritis

Chronic nephritis occurs either as an aftermath of acute nephritis, or more commonly in older dogs, as an insidious disease that develops gradually without apparent cause. The interstitial connective tissue of the kidney slowly encroaches upon the parenchymatous portion until there is interference with the resorptive function of the renal tubules. This results in the inability of the kidneys to concentrate the glomeruler filtrate. Thus, the volume of urine is greatly increased (polyuria), and at the same time, thirst is increased (polydypsia) so the animal drinks large amounts of water. As long as the waste products continue to be eliminated from the blood, no other symptoms are observed, but when protein wastes begin to accumulate in the blood, symptoms of chronic uremia develop.

Diagnosis. Diagnosis of chronic nephritis is based upon clinical symptoms plus urinalysis and renal clearance tests. Urinalysis reveals a colorless urine of low specific gravity, and either an absence or only trace of albumen. Blood urea tests show reading of 50 to 60 mg. % or more. Without laboratory tests, chronic nephritis may be difficult to diagnose. Types of cases that should be suspected are especially those in older dogs that are generally unthrifty, are subject to digestive upsets, skin trouble, or arthritis. Diabetes mellitis is similar in some respects but quite different in others. The excessive thirst, large volume of urine, and loss in weight are observed in both diseases, but in diabetes mellitis the urine has a much higher specific gravity and is positive for sugar.

Treatment. Treatment for chronic nephritis is designed principally to prolong life by suppressing uremia. There is no known method of reversing the pathology already present in the kidneys. However, by proper care and feeding, the patient may be able to live a fairly normal existence for months or even years.

Supply plenty of drinking water at all times because increased fluid output is the only means of compensating for the kidney dysfunction. The diet requires careful consideration. The patient must be nourished properly, and at the same time, nitrogenous waste products held to a minimum. This can be done by using a balanced diet including proteins of good nutritive value and adequate minerals and vitamins. It is important to avoid an excessive quantity of protein food, especially that of poor quality. Milk and milk products with cereals, fats, and small amounts of eggs and meat may be used. Again, the prescription diet developed by Morris for nephritic dogs is a convenient way to feed the patient properly. Avoid over feeding and highly seasoned foods.

Antibiotics may be helpful in some cases. Acute exacerbations are treated with antibiotic and parenteral fluids much the same as in the case of acute nephritis.

As the kidney function gradually becomes more impaired, these cases finally terminate with symptoms of acute uremia.

Disease of the Urinary Bladder

Next to the kidneys, the bladder is the portion of the urinary tract most susceptible to disease. Cystitis, lithiasis, incontinence, contusions, and malposition are all common conditions.

Cystitis

Cystitis or inflammation of the bladder is a frequent problem in both dogs and cats. It occurs especially in spayed females where it is associated with vulvitis and urethritis resulting from estrogen deficiency. However, it also may affect unspayed females and males. The usual cause for cystitis in male dogs is retention of urine in the bladder as the result of diseases of the prostate gland. In animals that are thoroughly house broken, excessive voluntary retention of urine also may be a causative factor. Other types of etiology include improper diet, insufficient fluid intake, injuries, calculi, bladder paralysis, poisons, and infection. Infection always enters into the picture either as the primary cause or as a secondary invader. The organisms most commonly found are of the coliform type. They are urea splitting organisms and are responsible for ammoniacal fermentation of the urine. The urea is transformed, through their action, into ammonia which is irritating to the mucosa of the bladder and urethra. This accounts for the strong ammonia odor and the alkaline reaction of the urine. A meat diet normally produces an acid urine, but in cystitis through bacterial action on the nitrogenous waste, alkaline urine is produced. These facts establish that alkaline calculi are the result, instead of the cause of cystitis, as might otherwise be suspected. The symptoms of cystitis are those of straining, frequent urination, and sometimes incontinence of urine. The urine has a strong ammonia odor, is turbid and may contain blood, pus, and mucus. A dog suffering cystitis often can be detected in a hospital ward by the strong ammonia odor which permeates the entire ward. In acute cystitis, symptoms of depression, stiffness of the hind parts, inappetence and fever may occur. Palpation of the bladder region produces evidence of pain. The bladder wall is thickened and usually constricted in a state of spasm. In chronic cases, the bladder may be overfilled with foul smelling turbid urine.

Urinalysis reveals an alkaline reaction and the presence of variable amounts of albumen. Microscopic examination discloses squamous epithelium, blood, pus, bacteria, and crystaline substances.

Diagnosis is based upon examination of the urine in addition to the clinical symptoms. Often no other symptoms are observed except the changes found in the urine.

Treatment. Objectives to be kept in mind in treating cystitis are: (1) Control infection,

(2) change the pH of the urine back to the acid side, (3) provide a proper diet, and (4) prevent recurrences.

Urinary antiseptics play a major role in the treatment of cystitis. The most effective are the broad-spectrum antibiotics such as streptomycin, terramycin, aureomycin, and chloromycetin that suppress the Gram-negative coliform organisms. Some of the sulfonamides are also effective in the treatment of cystitis. Gantrisin is the one that is best known for this purpose. It may be used either alone or in combination with the antibiotics. Mendelic acid and methenamine, although less effective, are useful in mild cases and during convalescence. As a routine, when antibiotics are used, they should be given in full dosage for at least five to seven days. This then may be followed by methenamine or mendelic acid for another week or more.

Changing the pH of the urine toward the acid side is helpful in treating cystitis. It inhibits certain types of organisms and also helps prevent the formation of alkaline calculi. Acidifying agents in common use are sodium acid phosphate, ammonium chloride, and chlorethamine. Any one of these may be used, although it is not always possible to acidify the urine in the presence of urea-splitting organisms. In such cases, antibiotics in combination with the acidifying agent will usually effect relief of symptoms.

The diet should be high in carbohydrates, fats, and vitamins and low in proteins and minerals. Proteins fed should be of good nutritive value so that they are metabolized with a minimum of nitrogenous waste. Milk, eggs, cereals, and fats are foods particularly recommended. Minerals are held to a minimum in order to discourage formation of calculi. Abundant fluid is always beneficial in the treatment of cystitis. Water is said to be a good urinary antiseptic. It not only flushes the bladder but also helps prevent calculi. The addition of vitamins including A, D, and the B complex is good supportive therapy.

In order to prevent recurrence of cystitis a special effort is made to remove the underlying causes such as estrogen deficiency in females and diseases of the prostate in males. Supply plenty of liquids and promote good bladder elimination. Maintain an acid urine by the use of acidifying agents and proper diet, and keep the patient in the best possible nutritive state. In spite of everything that can be done there is a marked tendency for cystitis to recur.

Incontinence of Urine

Incontinence of urine is a problem worthy of special consideration. Actually it is not a disease in itself, but rather a symptom originating from a variety of causes. Incontinence occurs most commonly in spayed females where it is associated with vulvitis and urethritis. A lack of estrogenic hormone results in reduced resistance of the epithelial surfaces and loss of muscular tone of the urogenital passages, thereby predisposing them to infection and inflammation. This type of incontinence usually responds well to estrogen therapy and urinary antiseptics. In many cases it is necessary to continue the use of estrogen in small doses for an indefinite period. There are many other causes for incontinence of urine such as nervousness, urolithiasis, cystitis, urethritis, strictures of the urethra, diseases of the prostate gland, neoplasms, and diseases affecting the nerve supply to the bladder. When incontinence occurs with an empty bladder, the cause is usually either cystitis, or a paralysis of the bladder sphincter. On the other hand, when it occurs with the bladder distended, the cause is most likely a paralysis of the bladder muscle, or urethral obstruction. In old dogs, dribbling of urine is often associated with general debility and loss of muscle tonus.

Each case of incontinence is diagnosed according to the underlying cause and treated accordingly. Those cases associated with nerve paralysis are usually unfavorable, while those resulting from inflammations, enlarged prostate and calculi usually can be handled successfully.

Retroflexion of the Bladder

Retroflexion of the bladder occurs in male dogs in conjunction with perineal hernia. The bladder is turned back into the hernial sac where it becomes incarcerated and the outlet is blocked so that no urine can be passed. This causes acute clinical symptoms characterized by a sudden increase in the size of the perineal hernia and severe pain. There is stiffness of the hind parts, straining, and sometimes vomiting. Unless relief is obtained quickly, uremia and shock result in death.

Treatment consists of emptying the bladder as soon as possible and returning it to its normal position. Since it is usually impossible to pass the catheter, the bladder is tapped with an 18-gauge needle over the perineal swelling

(*Continued on page 174*)

Observation On Canine Distemper†

WAYNE H. RISER, D.V.M., M.S., Skokie, Illinois

A veterinarian who will present a paper on canine distemper either has an undue amount of courage or does not fully realize the many ramifications involved. I hardly qualify in either category, but during the 23 years I have been in practice I have had a keen interest in this disease. Distemper, more than any other disease, is full of uncertainties and mystifications. It is encouraging, however, that each bit of increased knowledge and every new immunization agent has enabled practitioners to cope better with the problem.

Be that as it is, there is still much to be desired in handling all phases of the disease. There is little evidence that the problem of distemper immunization has been solved completely, even though immunization results with each new agent marketed, as reported by some practitioners, appear faultless and fantastic. In our practice, we have been unable to duplicate the immunization and therapeutic efficiency cited in some of these reports.

In 1955 Ott and Gorham[1] reported on their work in distemper immunization and stated that their experience indicated some doubt whether many vaccinated dogs, regardless of the immunization product used, could stand distemper virus challenge after a lapse of a few months, providing there is no additional challenge to bolster the antibody production in the interim. Then Schnelle[2], in an abstract of his paper given at the A.V.M.A. meeting at Minneapolis, said, "It has been proved that chicken embryo virus vaccine, tissue vaccine, and ferret-adapted vaccine do not uniformly confer durable immunity against distemper. Such failure to protect appears to be in a higher percentage than hitherto reported.

"It is suggested that a re-evaluation of the problem of satisfactory immunization against canine distemper is needed and that a more honest acceptance of widespread failure of vaccination would be in the interests of the canine population, the dog-owning public, and the practicing veterinarians."

These reports in themselves are discouraging, but they closely tally with the analysis of the immunization results from experiences in our practice.

Ten years ago while practicing in Des Moines, we found that, generally, once dogs had been vaccinated against distemper, few "breaks" were seen. However, upon moving to the Chicago area we were embarrassed when we found that distemper-like illnesses frequently occurred in dogs that were considered solidly immune. Inquiring of practitioners who had had years of experience in the Chicago area, we found that it was not uncommon to see aged dogs ill with unaccountable distemper-like symptoms. It puzzled us why there was seemingly more lasting and solid immunity in the dogs handled at Des Moines than in those vaccinated in the Chicago area.

In 1950 Morris[3], talking before the Chicago Veterinary Medical Association, related that the products tested by him on dogs at his nutritional laboratory, failed to produce lifetime, solid immunity against distemper unless the dogs received frequent actual challenges of live virus. It then occurred to us that this might account for the seemingly solid immunity experienced in our Des Moines practice in contrast to the more frequent "breaks" that we saw in Chicago. In Des Moines there was no leash law, dogs were allowed to run and, hence, be challenged frequently by natural exposure. In Chicago the leash law is observed strictly and dogs are only challenged by virus when they visit veterinary hospitals, boarding kennels, dog pounds, or dog shows. Such exposure for the average dog is probably not more frequent than once or twice a year.

Ott and Gorham[1], using both live egg-adapted vaccine and killed formalized tissue vaccine, observed the following immunization trends:

1. Contrary to expectation, the tabulated data show that there was no evident correlation between the age of the individual and the neutralizing titer of the serum in either the vaccinated or unvaccinated group.

2. Two factors which did appear to affect the level of circulating neutralizing antibodies were; (a) vaccination, and (b) environment, particularly contact with other dogs. Types

†Presented at the 38th annual meeting of the Southern-Florida State Veterinary Medical Associations, Jacksonville, Florida, Oct., 16-19, 1955.

of vaccines used did not appear to alter results appreciably.

3. Under conditions of this survey, it appears that the neutralizing antibody titer may be directly proportional to the interval of time between vaccination and sampling. Dogs vaccinated less than one month before sampling revealed a relatively low titer. The group vaccinated more than a month but less than two months gave the highest titer. Those vaccinated three months evidenced high titers but less than the previous group. Dogs vaccinated five to ten months without being challenged ran considerably reduced titers and one dog had no neutralizing antibodies in his serum. This revealed a possibility of vaccination failure.

4. It would appear that repeated exposure is necessary to maintain a relatively high neutralizing antibody titer.

5. Serum collected from dogs late in the course of frank, and often fatal, distemper is extremely low in neutralizing antibodies. This may indicate that when the antibody level is too low, a viremia results which causes a suppression of neutralizing antibody production.

If these five points can be substantiated in repeated experiments, some of the thinking regarding distemper immunization will have to be changed. From our observations we have gained the impression that the trends cited by Ott and Gorham[1] tally well with our experience.

One of the best examples we personally have seen that dogs lose their immunity to distemper can be illustrated by the following incident. A family had a Springer Spaniel bitch that raised several litters of puppies throughout the years. Three favored pups of this bitch were kept as pets, until four dogs were maintained by the family. As the youngest dog, a five-month-old puppy, was in the process of maturing, it developed distemper and had to be destroyed because of chorea. During the puppy's illness the bitch and two litter mates from a previous whelping that had been previously vaccinated against distemper, withstood the challenge of the disease from the puppy. Three years later the two litter mates, then five years of age, were brought into the hospital for 14 days rabies observation. Because of their previous immunity record they were not given additional distemper prophylaxis, but after they were confined for seven days they both developed fevers of 103.5 F., diarrhea, and refused to eat. They were treated and at the end of the observation period appeared to be normal. They were returned home and seven days later the mother, then eight years of age, became acutely ill, showing signs of high fever, pneumonia, diarrhea, ocular and nasal discharge. Later this animal developed hyperkeratosis of the foot pads and euthanasia was performed because of chorea. These three dogs must have been previously immune to distemper because they withstood the challenge of the puppy, but, three years later, all three dogs "broke" with the disease and the eight-year-old had to be destroyed. This illustrates; (1) that previously immunized dogs can "break" with the disease, and (2) that seemingly well dogs can be carriers.

In our practice we have not made any attempts at determining distemper neutralizing antibody titers, but we have experienced illnesses in distemper-vaccinated dogs in which we have encountered anorexia, fever, coughs, nasal discharge, diarrhea, and occasionally, hyperkeratosis of the pads, chorea, and convulsions. This has happened so often that we have made it a rule to give all dogs confined in the hospital additional distemper protection unless they have been hospitalized within the previous 60 days. This protection consists of a regular dose of killed-tissue vaccine in the previously vaccinated dogs and homologous serum in the unvaccinated dogs. These prophylactic attempts have not stopped all "breaks" but we think that the results are good enough to warrant the expense.

The question is asked, "What is the illness exhibited by these dogs?" We have no way of knowing the cause of these "breaks," but surely such a clinic as ours having a sizeable volume of patient traffic is at all times likely to be contaminated with distemper virus, other viruses and a variety of pathogenic bacteria. When dogs do "break" under our care, they show one or more signs of distemper. These include: (1) Hyperkeratosis of the pads, (2) tonsillitis, (3) influenza-like septicemia, (4) kennel cough, (5) vomiting, diarrhea, and enteritis, (6) pet shop enteritis, (7) encephalitis, and (8) chorea.

In adopting this method of giving our hospitalized animals additional protection, our reasoning is as follows: It has been established that it takes an animal a period (14 days) to produce its own neutralizing antibodies when stimulated with an antigen. On the other hand, if that animal has been stimulated previously by a specific antigen, subsequent stimu-

lation by the same antigen takes only a matter of hours before neutralizing antibodies are produced again. (This is best known in the case of the use of tetanus toxoid.)

The fastest acting antigen is killed-tissue vaccine. It is produced by making a 10% emulsion of finely ground organs, usually spleen, liver, lung, and stomach, from a dog which is infected with the virus of Carré, plus a variety of bacterial invaders, that have been made chemically sterile. When the vaccine is given it is hoped that the antigen immediately will stimulate enough antibody production and protect the dog from the exposure he will receive while in the hospital. If immunity has been established previously, a repeat vaccination will start immediate neutralizing antibody production. If the dog fails to receive this repeat vaccine to stimulate renewed antibody production, there is a chance that antibody titer may be low and that the patient will became infected by the live agents that contaminate the hospital. The agents also may be potent enough to suppress neutralizing antibody production with a resultant viremia and bacteremia, hence the "break."

This repeat vaccination method does not prevent all illnesses. We have had our share of trouble, mostly in the form of mild fever and diarrhea, but cough, respiratory congestion, nasal, and ocular discharges do appear occasionally. In rare instances, the illness has been severe enough to cause chorea and convulsions, but the use of vaccine on admittance to the hospital has been followed by a marked decrease in "breaks" among healthy dogs.

The value of this procedure may be illustrated by the experience of one of our colleagues. He used the same method, but for economy reasons he omitted the vaccine when animals were older than seven years. In 1955, over the July holiday, his facilities were overcrowded and ten days later several owners reported illnesses among the dogs that had been boarded during the congested period. In checking records it was found that most of the illnesses occurred in the group of older dogs that received no vaccine. Many of these required extensive treatment and three developed nervous symptoms and were destroyed. In the vaccinated group, few dogs came back for treatment, but their illnesses were much less severe and no deaths occurred, even though they were from the younger group.

With reference to young dogs, eight weeks to six months of age, it is difficult to keep this age group in the hospital and have them remain well, regardless of distemper immunization methods used. The mortality is low, but they lose weight, develop coughs and diarrhea. From six to ten weeks is required before these puppies are fat and healthy again. Occasionally, if the stay is short, large doses of serum will protect the pup sufficiently, but if the stay is over a week, we are thankful if no trouble appears. We have the best results by giving large doses of serum plus killed-tissue vaccine. If the puppy is small, a half dose of vaccine is used. The serum is repeated each ten days, as is the vaccine because it is our hope that the antigen will start neutralizing antibody production before the viremia causes suppression of antibody production.

Another colleague raises Boxers and keeps them in a kennel at the back of the lot behind the hospital. At six weeks of age he administers antiserum; at eight weeks more serum, plus a dose of egg-adapted live virus vaccine. He reports all goes well until five to five and a half months of age. These dogs then go through a siege of diarrhea, coughing, ocular and nasal discharge, and weight loss. Mortality is limited to an occasional dog that exhibits nervous symptoms. It appears impossible to eliminate this cycle of infection.

If your experience with the various vaccines is that of Ott and Gorham, and Schnelle, it would be difficult to recommend any one vaccination program that is entirely satisfactory in every case; but each vaccine has merit and does enable owners to enjoy pets without too much danger of loss from distemper. There seems to be little difference in the value of any of the vaccines. Each has advantages and when used with judgment and care will produce immunity.

Killed-tissue vaccine will produce immunity when three doses are given. The immunity is of short duration unless there are frequent challenges with live virus or with a subsequent renewal of the antigen stimulation at frequent intervals. A big advantage is that killed-tissue vaccine causes no untoward reaction if the dog has low resistance.

Egg-adapted live-virus vaccine produces active immunity against distemper by producing the disease in a subclinical form. If the vaccinated animal has subnormal resistance, undesirable reactions, particularly of the nervous type, are likely to appear. Immunity depends upon the retention of live, activated virus in the cells. However, the work of Ott

(*Continued on page 182*)

Adrenal Corticoids In Surgical Patients†

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IT is known that hydrocortisone is the predominant steroid produced by the cortex portion of the adrenal gland. The normal daily output of cortical hormone varies according to the size of the animal. In man, it has been estimated to be in the neighborhood of 20 mg. daily[1]. However, in periods of acute stress, the need may be multiplied ten or more times. If the pituitary-adrenal axis is incapable of functioning adequately to meet this need, a fall in blood pressure, increase in pulse, hemoconcentration, coma, and eventually death will ensue. The danger of the development of this typical picture of shock is an ever-present problem in any acute stress situation. The exact cause of shock remains unknown, but every veterinary physician respects its consequences.

Classification of Shock

Shock is a symptom complex resulting from a wide variety of severe stress situations. It has been classified in different ways by different investigators. Various descriptive terms have been introduced to define shock, *e. g.*, surgical shock, medical shock, hemorrhagic shock, wound shock, traumatic shock, burn shock, toxemic shock, et cetera. However, such terms are inadequate to explain the complex mechanisms which eventuate in the development of a characteristic clinical picture. Some investigators may think of shock in terms of degree, *i. e.*, mild, moderate, or severe. This type of classification merely refers to degree and does not suggest the basic etiology.

Perhaps a more universally accepted classification of shock places it in three general categories:

1. *Neurogenic.* This type of shock is induced by severe emotional stress or nerve trauma. It is usually immediate in onset and recovery is rapid. A severe mental stress or severe blow on a nerve plexus are examples of initiating factors. In small animals, head injury is a good example. This form of shock is transient *unless* complicated by severe trauma or severe hemorrhage.

2. *Hematogenic.* This type of shock results from blood loss. For instance, in dogs a 40 to 50% sudden loss of the blood volume in ten minutes results in prostration. Blood volume replacement is important in treatment.

3. *Vasogenic, Secondary, or "True" Shock.* This type may result from a host of stress situations. It may be somewhat delayed in onset. When it occurs, it generally becomes evident within the first 24 hours following stress. However, in some cases it may not appear for several days after the stress insult to the system.

Physiological Studies

About ten years ago, Shorr and coworkers[2] suggested a theory that the shock syndrome consists of two stages; an initial compensatory and a subsequent decompensatory phase, referable to humoral factors with opposite actions. It was postulated that the compensatory phase is under the influence of a vasomotor excitor material (V.E.M.) and the decompensatory phase resulted from dominance of a vasomotor depressor material (V.D.M.). The two substances are normally present in the body but are not activated under normal conditions. They appear to become activated by the trigger mechanism of anoxia. The source of V.E.M. seems to be the kidneys, whereas V.D.M. apparently arises mainly in the liver with some probably coming from spleen and muscle tissue.

In the early stages of shock, the V.E.M. increases the vasomotor activity of the small blood vessels and their sensitivity to epinephrine. In other words, less epinephrine than normal is required to elicit a vasoconstrictor effect. In the later stages of shock, V.D.M. develops which has the opposite effect and shock is aggravated. The small arterioles are progressively unresponsive to epinephrine and eventually a stage is reached where relatively concentrated epinephrine fails to elicit a response.

The role of the adrenal cortex in shock states has been the subject of controversy for many years. It still is not clear, but studies during

†Presented at the 38th annual meeting of the Southern Florida State Veterinary Medical Associations, Jacksonville, Fla., Oct. 16-19, 1955.

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the past few years are worthy of consideration. Experiments on dogs by Ramey *et al.*[3] showed that an infusion of norepinephrine** produced less blood pressure rise in adrenalectomized than in normal animals. They further showed that a significant rise in blood pressure in the adrenalectomized dogs receiving norepinephrine infusions took place when adrenal cortex extract was administered simultaneously.

Fritz and Levine[4] noted that adrenalectomized animals die in circulatory failure in response to stress. In an attempt to study the circulatory failure, they used the technic of direct microscopic observation of the blood flow through the rat meso-appendix. The small arterioles of this tissue became refractory to repeated topical applications of norepinephrine but responsiveness was restored by the topical application of aqueous adrenal cortex extract. From their observations, the authors suggested the following hypotheses: Cortical steroids appear to be necessary to allow blood vessels to respond regularly and repeatedly to small amounts of norepinephrine without vasomotor exhaustion, thereby allowing normal homeostatic mechanisms to function which govern capillary blood flow.

The above studies in animals suggest that cortical hormone has some relationship to capillary tone which in turn is important to homeostasis of the individual. Cortical hormone appears to restore sensitivity of the vascular bed to vasoconstrictors and thus exert a permissive effect which allows compensatory influences to act.

Even in cases where the adrenal may be normal, the hormone distribution to the tissues is curtailed if adequate blood flow is not present. The same principle applies to intramuscularly administered cortisone acetate which is less readily absorbed at a critical time when the tissue needs are greatest. The poor circulation to the adrenal cortex or to muscle depots of cortisone in a state of shock is a compelling argument for the addition of hydrocortisone to the standard methods of treatment. In cases of suspected adrenal insufficiency, use of a new salt of hydrocortisone, hydrocortisone sodium succinate—solu-cortef® may be lifesaving.

Indications

Solu-cortef,® (hydrocortisone sodium succinate), is a white, amorphous, odorless, hygroscopic solid which is extremely water-soluble. The solubility in water is approximately 500 mg. per cc. which is about 1600 times more soluble than free hydrocortisone.

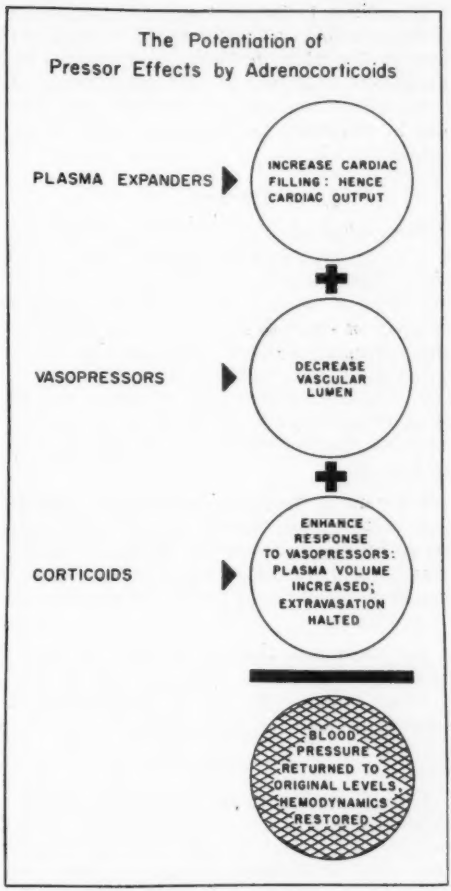
The Potentiation of
Pressor Effects by Adrenocorticoids
PLASMA EXPANDERS
INCREASE CARDIAC FILLING: HENCE CARDIAC OUTPUT
VASOPRESSORS
DECREASE VASCULAR LUMEN
CORTICOIDS
ENHANCE RESPONSE TO VASOPRESSORS: PLASMA VOLUME INCREASED; EXTRAVASATION HALTED
BLOOD PRESSURE RETURNED TO ORIGINAL LEVELS, HEMODYNAMICS RESTORED

Fig. 1. From extensive animal investigations, it appears that adrenal corticoids "trigger" the vasopressor effect. They restore normal vascular reactivity to both endogenous and exogenous norepinephrine and are particularly valuable in forestalling progressive insensitivity to continued norepinephrine administration.

These basic considerations justify the prophylactic addition of injectable solu-cortef to routine anti-shock measures in situations of anitcipated or manifest stress.

A solution for immediate intravenous or intramuscular injection may be prepared by adding 2 cc. of sterile water for injection to the contents of one vial; this amount supplies 100 mg. of hydrocortisone.

**A demethylated epinephrine formed at sympathetic nerve endings as a mediator of functional activity.

®The Upjohn Company brand of hydrocortisone sodium succinate for intravenous or intramuscular use.

In addition to the treatment and prevention of shock, solu-cortef may be used in any acute adrenal cortical insufficiency characterized by circulatory collapse, hemoconcentration, or coma, as well as acute hypersensitivity reactions and in overwhelming infections with severe toxicity.

Dosage

The dosage of solu-cortef for small animals is 5 to 20 mg., in large animals 100 to 600 mg. as initial doses. A maintenance dose is in the range of one-half the initial one and may be given at intervals of 1, 3, 6, and 10 hours afterwards, when deemed necessary. In shock, repeat doses are usually required and important. Cortisone or hydrocortisone injections may be given intramuscularly at the time of the first injection of solu-cortef if steroid therapy is to be prolonged.

When cortef therapy is employed in conjunction with antibiotic therapy for overwhelmingly severe infections, the cortef should be administered for as short a time as possible and should be discontinued prior to discontinuance of antibiotics.

For short-term therapy, as may be anticipated in selected cases of acute anaphylactoid reactions, solu-cortef may be given alone in intravenous doses as necessary.

Contraindications

Except when used for emergency replacement therapy for acute adrenal cortical insufficiency, solu-cortef is contraindicated in animals with tuberculosis, chronic nephritis, and peptic ulcer. Existence of congestive heart failure, diabetes, or osteoporosis requires that this new agent be administered with extreme caution. In the presence of infection, the causative organism must be brought under control with appropriate antibiotics, or else hormone therapy should be discontinued.

Summary

Cortical hormone has a relationship to capillary tone in animals and hence in shock. Solu-cortef (hydrocortisone sodium succinate for intravenous or intramuscular use) appears to restore to normal the reactivity of the vascular bed to vasoconstrictors, allowing antishock compensatory influences to act. To help support hemodynamics and prevent shock use: (1) Plasma extenders to increase fluid volume, (2) vasopressors to decrease vascular lumen, (3) corticoids to mediate the pressor effect. Hydrocortisone maintains blood pressure by "triggering" response to vasopressors. (See fig. 1, page 173).

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Urinary Diseases

(*Continued from page 168*)

and the urine withdrawn. Then the bladder usually can be replaced by digital pressure applied over the hernia. In some cases, an anesthetic is desirable to facilitate this procedure. In order to prevent a recurrence of retroflexion, surgical correction of the perineal hernia is indicated. It is advisable to wait until the patient has recovered from the effects of the retroflexion before attempting surgical repair of the hernia. (The operative procedure employed by us is that described by Blakely —Canine Surgery). In our experience this surgical technic has proved quite satisfactory. Castration is performed at the same time.

Blood Transfusions And Parenteral Fluid Therapy†

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BLOOD transfusions and parenteral fluid therapy have, as objectives, the restoration of fluid balance, provision of adequate nutrition, and the maintenance of proper electrolyte balance in patients unable to take adequate amounts orally. Recognition has been made that no one solution, even whole blood, can fulfill the specific needs of different patients. To meet these needs such solutions as protein hydrolysates for amino acid therapy and high caloric solutions using alcohol or fat emulsions have been developed, as well as various electrolyte and vitamin solutions. Today the emphasis is on specific treatment rather than outmoded "shot gun" therapy. It is important, therefore, that the clinician take full advantage of the products available to him. In the human field, electrolyte and water imbalances have been the cause of many deaths; investigators[1,2] have speculated that more lives will be saved by proper use of water and electrolytes than by most other therapeutic measures. This is undoubtedly just as true in veterinary medicine.

To appreciate fully the importance of fluid therapy it is essential to realize the major part played by water in the metabolism of mammalian tissues.

The importance of water in the living organism is displayed by the high content of this constituent in the muscles and internal organs. It has been estimated that these tissues are composed of 75% or more water, the quantity varying with age. Dukes[3] states that water comprises "two-thirds or more of the weight of the body and 70% or more of the weight of protoplasm." He goes on to say "a starving animal may lose all its glycogen and fat, half of its body protein, and about 40% of its body weight, and still live, whereas the loss of 10% of its water causes serious disorders, and the loss of twice that amount causes death."

Among the functions performed by water in animals is the transport of nutrients from one part of the animal to another. This is accomplished by dissolving or suspending the nutrient in body fluids. Water reacts chemically with many nutrients, breaking them down into simpler compounds which can be used more easily by tissues. Nutrients carried by body fluids include all types from solids to gases. It is, of course, redundant to mention the removal of waste material by the body fluids and their transport to organs of excretion. These nutrients and waste materials are exchanged from the fluid medium to the cells through the cell membranes by the process of osmosis. Dr. L. C. Payne of Iowa State College discussed this process in his paper presented at the A.V.M.A. Convention in Minneapolis and anyone interested can read his article in the Proceedings.

Water as a constituent of blood helps to distribute endocrine secretions and, in itself, is a component of these secretions.

Water also plays an important role in the regulation of body heat. The part played in reducing high temperatures is obvious whereas the function of maintaining body temperature is not so marked. Body heat is produced by oxidation in the tissues and such reactions require the presence of water.

Body fluids are contained in three compartments between which there is a constant interchange. These three compartments contain extracellular, interstitial, and intracellular fluids. Water comprises about 80% of the blood volume in most of our domestic animals. Serum is approximately 90% water, while it comprises from 60-64% of an erythrocyte's composition.

It is understood readily from this brief review how important it is to maintain the fluid level of the body. The causes of dehydration are familiar to you as clinicians. In the normal dog, or the dog capable of taking fluids orally, the problem is corrected easily. However, in cases involving emesis or hemorrhage it becomes necessary to furnish fluid parenterally either as a replacement or as supportive therapy, or both.

Indications for transfusions of whole blood

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†Presented at the 38th annual convention of the Southern-Florida State Veterinary Medical Associations, Jacksonville, Florida, Oct. 16-19, 1955.

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are well known. Articles by Dr. C. E. Bild[4,5,6] which appeared in VETERINARY MEDICINE during 1953 and 1954 cover this subject. Witter[7] in his paper given at the 1952 A.V.M.A. convention in Atlantic City lists them as "trauma, shock, and hemorrhage; preoperative and postoperative care of debilitated and anemic surgical patients; and compensation for surgical hemorrhage. It is indicated also in persistent hemorrhagic enteritis, anemias of unknown etiology, leptospirosis, distemper, hemolytic bacteremia and as non-specific therapy."

Holden[8] and coworkers investigating the effect of excessive blood transfusion on the myocardium state, "The administration of blood to surgical patients, with the proper indications, has without doubt been one of the significant advances in the preoperative preparation of patients, operative surgery and postoperative care in the past three decades. The enormous volume of research performed on blood groups, pyrogens, anticoagulants, and direct and indirect transfusions has made possible the universal acceptance of this procedure."

Blood Transfusion

The use of blood transfusion in clinical veterinary practice is of fairly recent development as compared to other therapeutic areas. Still the earliest reports of blood transfusions were those attempted in animals.

The first successful transfusion of blood which is recorded in the literature was made in 1665 by Richard Lower[9], an English physiologist. This was followed in 1667 by the transfusion of lamb blood into a youth. During the next 150 years transfusions were rare, as there was no agreement on the indications for such a procedure and a great deal of disappointment was encountered because of the miraculous results expected. James Blundell[10], an English physiologist and obstetrician, began to use transfusions more frequently around 1818 and advocated their use in acute hemorrhage. He recognized and insisted that human blood was more effective than that of animals for human infusion.

Additional momentum was given to blood transfusion technics early in the 20th century with the discovery of the four human blood groups. Technics were still crude and consisted primarily of artery to vein anastomosis or the use of a paraffin tube—a far cry from our present day methods. This brings us up to the more modern methods of transfusion familiar to most of us, the use of syringes to withdraw blood from the donor and administer to the recipient.

Refinements in methods of collecting and infusing blood have been, and are being made continually. The development of non-pyrogenic plastic expendable sets has removed many of the hazards of the operation and, when used in conjunction with vacuum bottles, has changed a difficult procedure into one easily applied by any person capable of making venipuncture.

I will not take time to discuss the mechanics of collecting blood for transfusion as our veterinary literature contains a number of excellent papers on this subject. Anyone not familiar with the procedure will find the following very helpful: (1) In VETERINARY MEDICINE (June 1951), an article by Majilton and Kelley[11], (2) the description of the television demonstration at the 1953 A.V.M.A. meeting by Kingma,[12] or (3) the paper written by Witter[7] (Proceedings of the A.V.M.A., 1952).

The collection of blood for transfusions was further stimulated with the introduction of sodium citrate. Its value as an anticoagulant was discovered and described in a number of countries about 1914. This discovery permitted the so-called "delayed transfusion" and hence led to the development of blood banks. During World War I, the concept of blood banks was established, but was not developed until in the 1930's. Everyone is familiar with the widespread utilization of this procedure in World War II and subsequently.

Sodium citrate alone is widely used as an anticoagulant. However, it is not recommended for use in the collection of blood which will be stored for more than about 24 hours. Much better results will be obtained from the use of the A.C.D. mixture given in the Pharmacopeia of the United States[13], 15th revision, page 650. There are two A.C.D. solutions given whose compositions are as follows:

	Solution A	Solution B
Sodium citrate	22 gm.	13.2 gm.
Citric acid	7.4 gm.	4.4 gm.
Dextrose	24.5 gm.	14.7 gm.
Water for injection Q. S.	1000 ml.	1000 ml.

The incorporation of dextrose aids in preserving the erythrocytes and markedly inhibits hemolysis. One or the other of these solutions will be found in most of the commercially available blood collecting units.

The quantity necessary to prevent coagulation and be of value as a preservative during storage is 15 ml. of solution A or 25 ml. of solution B for each 100 ml. of blood. Blood collected aseptically can be stored at room temperature. However, most practitioners will find it desirable to refrigerate at a temperature between 35 and 50 F.

Blood collected in either of these solutions can be stored for a period of approximately three weeks. In some cases, the plasma then can be separated and kept indefinitely. However, Bild[9] has found that he secures more satisfactory plasma if the blood is not older than five days when plasma is removed. During storage of blood, there is a marked increase in plasma potassium and a decrease in sodium. Thus plasma from outdated blood does not have the same electrolyte level as plasma made from freshly drawn blood.

Hemolysis is a serious problem in any blood bank. The advisability of infusing blood with a small degree of hemolysis frequently arises. Whenever possible, such blood should not be used for transfusion. Blood which is beginning to hemolyze will not fulfill satisfactorily the clinical need requiring whole blood, that of supplying erythrocytes to the recipient. If it is volume that is needed it is much better to use plasma or one of the plasma volume expanders such as dextran or P.V.P. Free hemoglobin in the blood stream may result in renal ischemia and eventual renal blockage. DeGowin,[14] *et al.* were able to produce a fatal renal insufficiency in dogs with hemoglobin. Histologic examination of the kidneys from these dogs revealed obstructions in the region of the loops of Henle which contained casts of hemoglobin and pigment crystals.

In addition to the hemolysis that may occur in stored blood it is well to remember that coagulation after transfusion may be slowed down because of the presence of the citrate. This can be corrected by the administration of calcium to the patient. DeGowin, Hardin and Alsever[15] point out that after three days of storage there is a loss of approximately two-thirds of the platelets. This is also true of leukocytes. Platelet destruction occurs much more rapidly in some types of glass containers than in others. Platelet survival may be prolonged by the use of siliconized glass.

Storage of blood brings about only minor changes in the plasma proteins and complement. Prothrombin time may diminish about 50% in 21 days.

Outdated Blood

The problem of outdated blood frequently arises in a clinic where relatively few transfusions are made. By using old or outdated blood the clinician may observe the situation of hemolysis just mentioned. One must bear in mind that in any bottle of blood the red cells are of varying ages from newly formed cells to those of advanced age. It is generally agreed that the life of a mammalian erythrocyte is approximately 120 days within the body. This is altered by the change in environment experienced in stored or preserved blood. Granick[16] points out that the erythrocyte is one of the most intensively studied cells, but the manner in which this highly specialized cell maintains a functional life for 120 days is poorly understood. It is conceivable that when such knowledge becomes available, the life of blood in storage can be extended indefinitely.

Whole Blood Intravenously Only

The route of administration of whole blood should always be intravenous. There is no sound physiologic justification for the administration of red blood cells by any other route. Some reports can be found in the literature supporting intraperitoneal administration. The peritoneum has demonstrated some ability to facilitate the passage of red blood cells into the vascular system. The benefits derived from the administration of blood proteins will, of course, be obtained from subcutaneous, intramuscular or intraperitoneal administration, but due to the rate of absorption none of these routes have any value where volume is needed in the vascular bed.

Blood Types

The discovery of blood types helped solve many of the difficulties associated with transfusions in medicine. The matching of blood specimen from donor and recipient is now a routine procedure and has done much to promote the satisfactory use of blood. Its increasing use in veterinary therapy, especially in dogs, makes it desirable for the veterinarian to match blood before infusion. Young, *et al.*[17] and Wright[18] have reported considerable work with hemagglutinins and hemolysins in dogs. While these workers have not described clearly defined blood groups they have established that one dog may carry isohemagglutinins and hemolysins exhibiting characteristics of immune antibodies which will destroy the erythrocytes of incompatible blood. These can be of such

magnitude that the cells may disappear from the recipient's circulation in from 30 to 90 minutes.

The administration of plasma is not without danger as it also may contain immune bodies which will destroy the recipient dog's corpuscles over a period as long as 20 days.

Young, *et al.*[17] in his review of the literature mentions that other workers have described isolysins in goat and cat blood. Administration of incompatible blood may result in hemoglobinemia, hemaglobinuria, oliguria, glycosuria, hemoglobin casts in the urine, jaundice, erythrophagocytosis and leukocytosis.

Hundreds of transfusions have been given by veterinarians without any of these sequellae or at least only minor reactions. The increased use of blood transfusions in all animals, and especially dogs, calls for greater care on subsequent transfusions. Older dogs in particular, which may have been treated by other veterinarians, must be handled with increased caution. Care also must be exercised when a transfusion is planned for an animal known to have received blood previously. Patients receiving a number of transfusions can be expected to build up antibodies against donor cells. This is true whether the same donor or a different donor is used. The few minutes required to crossmatch the blood may save a great deal of time and concern on the part of the clinician. Melnich and Cowgill[19] found that dogs which were compatible on the first transfusion may on subsequent infusions develop a sensitivity which renders them incompatible thereafter.

The technic of crossmatching blood is rather simple and can be conducted in any veterinary hospital having equipment to do blood counts or fecal examinations.

After establishing compatibility by crossmatching, the question arises as to how much blood should be administered. This is always subject to the clinical need of the patient, and may vary from 6 cc. to as much as 20 cc. per lb. of body weight. Witter[7] has pointed out that dogs suffering from a toxemia will rarely tolerate more than 6 cc. per lb. In medical cases it may be desirable to restore the blood volume by using smaller doses and administering several transfusions. This will help maintain hemoglobin levels and permit the patient to make full use of the new blood. It also avoids overloading of the heart and respiratory system. Excessive quantities of blood or fluid transfused in pneumonic conditions may severely tax the heart and can result in pulmonary edema.

In order to determine the quantity of blood which should be administered to an animal with a medical condition it is necessary to know the hemoglobin content of the patient's blood. This can be determined easily by use of the simple Tallquist method or more elaborate hemoglobinometers commercially available.

Bild[4] has given an excellent example of a method for calculating transfusion volume in his article published October 1953 in VETERINARY MEDICINE. To review it briefly let us assume that we have a 25-lb. dog with a hemoglobin value of 9 gm. per 100 cc. of blood. The normal blood volume is about 40 cc. per lb. of body weight. This means that a 25-lb. dog has approximately 1000 cc. of blood. Divide 1000 cc. by 100 cc. giving 10 cc. Therefore, in this patient, 10 cc. of blood should raise the hemoglobin 1%. In medical cases the blood volume should not be increased by transfusion by more than 20% in any one transfusion. Twenty times 10 gives us 200 cc. or the maximum amount which can be administered safely to this 25-lb. dog.

It must be remembered that hemoglobin values are relative and the 13 gm. per 100 cc. as given by Dukes[8] is only an average figure. Many dogs may be perfectly normal and have a somewhat lower hemoglobin value.

Blood transfusions given to correct severe hemorrhage of surgical or accidental origin tax the judgement of the clinician. He must estimate the amount of blood lost and attempt to restore it. A simple method used by some surgeons, to aid in the determination of blood lost during an operation, is to put all sponges used to remove blood into a pail and after surgery is completed the pail is weighed and a rough calculation made as to the fluid content.

Plasma has a definite place in restoring blood volume. It is equal to whole blood in almost every respect except for red cells. Plasma is particularly effective in supplying blood proteins. It is more easily kept on hand in a usable form than is whole blood. It can be administered more readily by routes other than intravenous. The same precautions should be taken to determine compatibility as are taken with whole blood. While the resulting hemolysis is not as rapid or dramatic it can produce undesirable effects in the patient. Young, *et al.*[17] have demonstrated the presence of hemolysins in plasma which increase the fra-

gility of the recipients erythrocytes for prolonged periods.

Dogs are extremely sensitive to changes in air temperature. Exposure to heat causes an increase in hematocrit. Fluid loss in animals subjected to a hot environment was found by Kanter[20] to be from the loss of intracellular fluid. There was a marked increase in urine potassium and bicarbonate.

During warm weather animals deprived of water and then subjected to hemorrhage will go into shock more rapidly than animals not previously dehydrated. Levinson, *et al.*[21] found while working with plasma in dogs, that dehydrated dogs developed shock after the loss in a single hemorrhage of from 25 to 30% of the original blood volume. These dogs failed to respond to infusion and the blood pressure continued to fall. Repeated hemorrhage during cold weather failed to produce shock and the dogs responded to plasma infusions similar to normal animals. Such factors as these must be considered in making a prognosis in a clinical case.

An attempt to provide blood volume in hemorrhagic shock by the administration of normal saline is likely to be disastrous. Allison, *et al.*[22] observed that dogs given whole blood recovered twice as rapidly as those that received plasma while 100% of the animals infused with saline died.

Summary

Water is essential for the maintenance of mammalian tissues and the carrying out of their necessary functions.

Blood volume can be restored most satisfactorily following hemorrhage by the infusion of compatible whole blood. The most satisfactory route of administration is by venoclysis.

Plasma has certain advantages over whole blood as far as storage is concerned. However, it should be used only with the realization that plasma is not a complete substitute for whole blood.

Normal saline should not be used to restore blood volume in cases of hemorrhagic shock.

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Feline panleukopenia vaccine is the most effective of killed viruses. Cats can be protected on administration of three or four injections of this vaccine beginning the series at an early age (six weeks). *Wayne Riser, D.V.M.*

Host Resistance To Bacteria In Traumatic Shock†

JACOB FINE,* M.D. Cambridge, Massachusetts

TRAUMATIC shock is an extremely common prelethal phenomenon in a variety of disease conditions. The features of this phenomenon are given as five general manifestations: (1) Collapse, (2) cold body surface, (3) pale or cyanotic mucous membranes, (4) rapid pulse, (5) anuria. Closer examination will reveal; low blood pressure, a greatly reduced venous oxygen concentration, a reduced cardiac output, an elevated carbon monoxide content of the blood, and metabolic acidosis. Microscopic examination reveals extreme vasoconstriction of the smallest arterioles, little or no flow through capillaries, and that blood is bypassing capillaries through arteriovenous anastomosis, and that return flow from peripheral circulation is slow.

As the shock phenomenon advances conditions as listed worsen until a nearly fatal stagnation of blood-flow is evident just before death. Which of the vital body tissues that fail to function concern us since the answer may reveal the key to the shock phenomenon responsible for rapid death.

The process is a rapidly fatal one, complete within a matter of hours. Investigations over a period of 15 years have eliminated certain tissues and vital organs as primarily responsible. Fatal renal failure takes several days to kill. Adrenal failure is followed by death in 18 to 24 hours or longer. The heart functions until just before death as do the lungs. The nervous system, both central and peripheral was eliminated early.

Study of liver function in traumatic shock has consumed investigators and reference should be made here of cross-circulation experiments conducted in considering the role of this vital organ. Cross-circulation experiments, *i.e.*, connection of the general circulation of the healthy and ill dog does not hurt the donor or do the recipient good. However, when the donor's circulation is connected to an important vein of the recipient in early shock, so that the liver receives a good supply of fresh blood throughout the shock period, that animal will then survive until transfused. It appears then that the liver is the key organ in traumatic shock.

Examination discloses that all functions of the liver are out of balance, which is also true of other tissues. The problem stymied researchers for a long period until consideration was given the possibility that infection might be the responsible factor, if the reticuloendothelial system failed, as it does, for example, in radiation sickness.

Tissue Infection

Dog tissues, except the brain and spinal cord, as is well known, are infected with Clostridium, which appears to be of no especial importance in shock. Serum therapy has little value for treatment. These organisms are not found in normal tissues of other species. If, however, blood and tissue cultures are made within minutes after death in dogs, many varieties of organisms common to the intestinal tract may be isolated from blood obtained from the portal vein, in the pancreas, and in some other tissues.

To be sure, bacteria can not be found before death because they are killed as fast as invasion from the intestine occurs. More and more evidence has been accumulated that supports this principle of bacterial invasion as a normal condition, and that diseases due to prevailing microflora common to most mammalian species, is due to a breakdown of a natural defense mechanism of the host. In other words, bacterial invasion is the rule in all species including man, and illness results because defenses fail.

Accepting the above as a contigent hypothesis further experimentation may be briefly outlined as follows: A narcotized healthy dog is allowed to bleed by cannulization into a vessel elevated so that the lowest blood pressure the animal will tolerate can be maintained. This has been determined to be 30 mm. of mercury. At some point or other, the animal will die unless transfused with all the remain-

†Presented at the 38th annual meeting of the Southern-Florida State Veterinary Medical Associations, Jacksonville, Florida, Oct. 16-19, 1955. (Compilation from stenotype notes of address).

*Professor of Surgery, Havard Medical School.

ing volume of blood in the vessel. If time is allowed after the maximum blood volume is collected in the vessel, it begins to run back into the patient until all is returned. Blood so returned does not help this dog and death ensues.

If instead of letting the blood run back on its own, it is returned as a transfusion at a point in the observation, the animal will recover completely. This point is two hours after the process has started.

If we wait between four and five hours before transfusion of blood not returned to the circulation, a pressure reaction occurs which afterwards falls, again terminating in death. In other words, two hours sharp is what is referred to as reversible shock. It is reversed by transfusion. Five hours sharp is irreversible shock. These findings provide useful tools in the investigation as to what is responsible for the death of an animal in traumatic shock.

If two-hour shock is reversible and five-hour shock irreversible, then something happens between the second and fifth hour that has allowed development of a lethal factor. It was reasoned that some system collapse resulted or that infection developed. We assumed that if infection was present, pretreatment with antibiotics would alter results. This is exactly what happened. Whereas experience indicated 80 to 90% mortality in simulated five-hour shock, administration of antibiotics reduced mortality and results were 60 to 80% recoveries. This illustrates that infection is operating to kill. Although organisms can not be found, probably because they are too few to grow by existing cultural methods, we can demonstrate that infection is responsible.

It was learned experimentally that if a quantity of 200 gm. of macerated liver from a normal healthy dog was injected intraperitoneally into an induced two-hour shock patient, the condition is reversible and the dog recovers. A normal dog also survives the intraperitoneal injection of liver mash. If instead of using macerated normal liver, a similar preparation of a five-hour shock liver is given in like dose, the two-hour shock patient succumbs and the control lives. The shock liver mash is then assumed to contain something different from the liver mash made from a normal liver. Again, on the assumption of the bacterial theory, the animal getting the shock-liver mash at the two-hour shock period when treated in advance of symptoms by injection of antibiotics, survived.

These and other supporting facts, determined by experimental observation, is good evidence that the animal dying of shock is being exposed to intolerable mass infection, in spite of inability to locate specific microorganisms.

So few bacteria are present in normal tissue that they can not be grown out. How many microorganisms, or what volume of infection, is required to kill an animal that has suffered shock of four or five hours duration, has also concerned us.

What we have tried to do is to find out how much bacterial toxin was lethal in advanced shock. In the experiments to be reported here, rabbits were employed for convenience of assay technics. A normal rabbit succumbs uniformily on intravenous injection of 0.1 mg. of purified bacterial toxin. Half this quantity 0.05 mg. is not lethal attesting to the test precision. When a rabbit is injected with toxin four hours following complete recovery from reversible shock, it requires only 0.000001 mg. to kill. It may be seen that the patient shortly after complete recovery from shock is 100,000 times more sensitive to bacterial toxin than is the normal. If the challenge interval (time between recovery and challenge) is lengthened the lethal dose must be increased so that normal resistance is gained at about 48 hours from shock recovery. This theory explains sudden death after apparent post-shock recovery. Animal appears to be doing splendidly but considering supersensitiveness to bacterial toxins, extreme care must be exercised to allow development of normal or near normal resistance.

Theorizing break down of bacterial defense mechanisms of animals in shock, an experiment was planned in which a normal animal and one recovered from reversible shock were injected with viable bacteria. If from 5,000,000 to 15,000,000 viable organisms (24-hour culture) are injected intravenously into a normal dog, less than 10 per cc. can be recovered from circulating blood within six hours; none within 24 hours. In contrast, the recovered two-hour shock patient clears organisms injected fairly well within six hours, but develops bacteremia in 24 hours and succumbs within two or three days. The shock patient suffers 100% mortality on challenge with bacteria injected in the blood stream that is handled by the normal animal with ease. This is evidence, of course, that one animal has lost resistance to bacteria. It does not

reveal the system responsible for the phenomonon.

Six bacteriolytic systems were studied which included: Phagocytosis, serum opsonins, serum properdin, mobilization of leukocytes and macrophages to site of challenge, neutralization of toxins, and capacity of bacterial lysis. The last mentioned is under intensive investigation at present. All others have been studied. Each is effective to some degree in the shock patient.

Properdin

Properdin is the first clearly identifiable substance in the defense reaction. It is known generally and accepted that bacteria introduced into the blood stream begin to disappear. After a time, however, bacteria eventually take over and the blood instead of being a suppressor is a good culture medium. What suppresses bacteria in the first place and then contributes to the failure of blood to continue to keep bacteria from traveling is the next leading question.

Dr. Louis Filmer described properdin in August 1954. Serum globulin is the substance when, in the presence of magnesium ions attaches to C-3, or to the third component complement, and enables the compliment to lyse bacteria. In other words, in the absence of complement, bacteria are not killed, and in the absence of properdin, the complement is not activated to kill.

Properdin performs in a sense as a natural antibiotic. It is found in highest concentration in rodents, cats, dogs, cattle, and finally man. This appears to be rather significant as a biological fact in trying to explain the prevalence and resistance of the rat and rodents generally. Its importance is revealed in recent studies on radiation sickness. Bacteremia is common after five days of radiation exposure which invariably terminates in death. On examination such animals give a near negative test for properdin. If during the course of the condition properdin serum is given, existing bacteremia is overuled and the patient recovers.

Blood of normal animals has been shown to contain 12 to 18 units properdin per cc. Examination of the two-hour shock dog reveals a greatly reduced unitage of properdin. If transfused at this point properdin unitage remains low for four to seven days, then returns rapidly to above normal range for ten days before returning to normal quantity.

Experiments conducted at various laboratories have indicated variable results probably due to the general health and state of nutrition of experimental subjects. Adequate diets, proper management, climate and region, and natural bacterial resistance appear to influence properdin levels.

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Canine Distemper

(*Continued from page 171*)

and Gorham reveals that if the dog is not challenged periodically with active, virulent virus, the immunity is also short-lived and periodic stimulation with additional vaccine is necessary if the immunity is prolonged.

Distemper virus is perishable and is preserved best by lyophylization, which is a quick-freeze dehydration method. Faulty technic in preparation or handling, and added moisture content, will cause the virus to die and the vaccine to be worthless.

Gorham[4], reporting at the A.V.M.A. meeting in 1955 said that in his experience many commercially packaged vaccines, particularly those nearing the expiration date, were no longer viable.

Conclusions

1. The work of Ott and Gorham, and Schnelle, indicates that the efficiency of canine distemper vaccine should be re-evaluated.

2. Evidence indicates all types will produce immunity against distemper but none will produce lifetime immunity without repeated challenges with the live virus.

3. The worth of live-virus vaccine depends upon special handling to preserve it. This vaccine probably carries too long an expiration date.

4. Distemper vaccine, regardless of type, should be used with judgment. Frequent periodic booster inoculations are needed if individual immunity is to be maintained.

5. When a dog is revaccinated owners should not be assured of lifetime immunity to distemper. Booster inoculations should be recommended.

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Surgical Seminar†

During the morning session of the second day, a surgical seminar gave a select group of authorities opportunity to discuss aspects of surgery, postsurgical care, shock, and therapy recommendation. The seminar was moderated by Dr. Jacob Fine.

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Cardiac and Respiratory Arrest

Cardiac arrest may be classified under two types; ventricular fibrillation, and systole (contraction). In either instance there is stagnation of blood.

Respiratory arrest is governed by a large number of factors, the most important of which is interference with the respiratory center of the brain. It also may be caused by lack of oxygen or overabundance of carbon dioxide. In this regard, precaution to guard the patency of air passages may be emphasized.

Prevention of possible cardiac and respiratory arrest is rational. Physiological effect of parasympatholytic drugs, such as atropine sulfate which blocks transmission of cholinergic impulses to the heart, administration of oxygen, maintenance of respiration, and well planned and good nursing contribute to assure satisfactory recovery.

In emergency, heart function may be restored by massage, electrical or physical shock, or injection of sympathomimetic drugs. Once respiration ceases, analeptics are far less effective than when they are used routinely to reduce duration of depression.—*Fred Kingma, D.V.M.*

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Fluid and Electrolyte Balance in Surgery

One of the greatest hazards in successful surgery is reduction in blood volume. This may be due to excessive hemorrhage, loss of volume through vascular collapse, to loss of fluids from the vascular bed by osmosis or hemoglobin concentration.

Loss of blood volume by hemorrhage can and must be corrected by administration of whole blood. Plasma expanders may be employed when erythrocytes are not lost in volume.—*Jacob Fine, M.D.*

†Presented at the 38th annual meeting of the Southern-Florida State Veterinary Medical Associations, Jacksonville, Fla., Oct. 16-19, 1955.

Therapy in Shock

Hemoconcentration, or an increase of blood cells in the blood vascular system resulting from loss of plasma or water, is not an essential feature of shock but does occur on occasion. It is not characteristic of the shock complex.

Shock is a complex resulting from injury responsible for derangement of many functions. The shock with which we are dealing, traumatic shock, differs from moribund shock or that resulting from coronary thrombosis in man. Traumatic shock is basically a symptom complex resulting from reduction in venous return and blood pressure with impairment of circulation tending to progress steadily to irreversible circulatory failure and death.

Characteristically the syndrome is observed in hemorrhage which must be 30% or more loss of the total blood volume. In some instances, as may be the case in ill or undernourished patients, less than 30% blood loss may cause shock. The patient's general health then must be evaluated with the understanding of these principles.

In the event of blood loss, transfusion of whole blood is the first choice of a therapeutic agent. If compatible blood is available, it is beyond doubt the best possible fluid. If not available, substitutes must be selected.

Emergency use of saline solution may serve for immediate pressor effect. It will not maintain volume of circulating fluids. In the acute situation, plasma is little better than substitutes. Dextran, in limited amounts may serve temporarily. Polyvinylpyrrolidone (PVP) should not be used on dogs because these animals have a natural sensitivity to the agent. Gelatin preparations are good as plasma extenders. Immediate needs may be supplied by these substitutes. Blood must be given if there is continuing loss. Of course, if major vessels have been opened these should be repaired and tied off early.

Quantity of fluid to give may be determined clinically by reversal of signs of shock. Mucous membranes assume a pink coloration, skin warms, bladder fills, and pulse accelerates. These are the signs that enough fluids have been replaced. Do not give more. Watch for relapse which might occur if insufficient amounts of fluids have been given or blood loss is continuing.

If, after fluid therapy, no response is elicited, the patient may have advanced into irreversible

shock. Animal may have been in shock longer than apparent or reported and in such cases transfusion will fail as a life-saving measure. Many agents have been tried, including hormones, which may appear to give relief but fail to support life except for limited periods.

In the event that shock is due to loss of fluid through diarrhea or vomiting, fluid and salt replacement serve well. Plasma loss also occurs in severe cases and transfusion of blood or plasma may be indicated in these cases. Replacement of protein loss may be considered since in any dehydrating influence body proteins are lost.

In shock due to massive soft tissue injury, burns, severe dehydration, or hemorrhage, circulatory changes are similar. The circulation is stagnant. Other symptoms differ, of course. An animal suffering a wound differs from one suffering from frank blood loss, burn, or sepsis. The clinical condition is superimposed on the shock syndrome. Treatment of the pathological process with shock therapy must run concurrently. This includes, repair or debridement, treatment of infectious processes, or others.

There are times when an animal is close to shock or in the early stages of such condition. Then, immediate application of appropriate physical therapy for removal of the underlying etiology is the most important item. If infectious processes are advanced, as for example, peritonitis, nothing is effective. If a large exudate is present in the peritoneal cavity replacement of deficiency in blood circulation alone can not be relied upon. Bacterial toxins liberated in lethal quantity results in an irreversible situation. Antibiotic given during shock can not be expected to help. Only when given in advance can the animal, a potential shock patient, be protected. That is to say, instead of getting 60 to 80% recoveries, one may expect a 40% recovery rate. Unless given in advance, antibiotics are valueless. Timing is crucial in shock therapy. Cooling has also proved important as a protective agent providing it can be applied in advance of the shock syndrome.—*Jacob Fine, M.D.*

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Aftercare of the Surgical Patient

Considering aftercare of the surgical patient may be restricted to that interval between the time the patient leaves the operating room and is returned to the ward in satisfactory post-surgical condition. The patient is moved from the operating room to the recovery room that is located most advantageously adjacent to the surgery. Responsibility for care at this stage must be vested in a designated qualified individual. That reliable and trained person should be equipped for emergency treatment with apparatus for oxygen therapy, suction apparatus, forceps, cotton, stimulants, et cetera, and understand indication for use of each. If postoperative complications are anticipated, special equipment might be provided and the nurse cautioned in regard to what might occur. Records should be made during this period, including color of mucous membranes, pulse, temperature, or other observations. This is a good time to groom and otherwise cleanse the patient by thorough removal of excrement, blood, et cetera. It may also be an opportune time to trim toenails, clean teeth, trim hair at feet, brush out matted hair, or other simple procedures whether requested by the owner or not. Postoperative cleanliness is important for the patient's comfort and for esthetic reasons. Guard against extremes of hot or cold. A moderate degree of hypothermia has been observed to be desirable in our practice. Heat exhaustion is not uncommon during recovery from anesthesia. Other safeguards must be applied. The absence of reflexes makes it possible to burn, scald, drown, strangle, or injure a patient without realizing that such an accident is occurring. Padded cages are available at the Angell Memorial Animal Hospital. Sheets of foam rubber may be suspended from the sides of the cages and cut to cover the floor. Struggling, hysteria, or other manifestations of the excitement stage of recovery may be controlled by judicial sedation with demerol® or similar drugs which must be used cautiously.

Rules to be observed include avoiding anything that may frighten; watch for sudden dyspnea, use intravenous fluids cautiously to avoid overhydration or contribute to pulmonary edema, watch for vomition or regurgitation of fluid, use oxygen freely, atropine for drying secretion, and inhalation of alcohol vapor to serve as a wetting agent. Have an aspirator handy.

When recovery is complete be certain that records are sufficient to acquaint the ward attendant of the patient's condition and therapy given.—*C. Lawrence Blakeley, D.V.M.*

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A New Anesthetic for Veterinary Use

JOHN M. GILLISPIE,* D.V.M., and
WILLIAM G. MAGRANE,** D.V.M.

A new intravenous anesthetic especially designed for short to moderately long surgical procedures, in veterinary medicine, has been developed by Abbott Laboratories. This anesthetic, called combuthal®[1] was intentionally designed so that one intravenous dose would produce 25 to 45 minutes of anesthesia. Combuthal is a combination of the sodium salts of pentothal®[1] and nembutal®[1]. It produces a smooth induction period and the recovery period is short (30 to 60 minutes duration) and practically excitement-free. At the same time, combuthal has certain advantages over surital®[2] sodium and pentothal in that one intravenous dose lasts for 25 to 45 minutes without necessitating the administration of additional amounts of the anesthetic. In our opinion, combuthal is superior to the ultra-short acting anesthetics available for use in veterinary medicine. The induction period is not only extremely smooth, but in addition, one may proceed more slowly during induction. There is no nausea and the period of anesthesia is good to excellent. The shortness and smoothness of the recovery period further increases the value of this anesthetic.

Combuthal has certain of nembutal's advantages in that the period of anesthesia is lengthened and the skeletal muscle relaxation improved. However, nembutal solution alone still has a definite place as a small animal anesthetic for longer operative procedures.

This article is written to report on 233 cases which include a variety of surgical procedures such as: Ovario-hysterectomies, herniorrhaphy, orthopedic operations, urethrotomies, excision of tumors, dental operations, roentgenography, dermoidectomy (eye), orchectomies, implanting of radium in carcinogenic tumors, removal of foreign bodies, and minor surgical procedures. Surgery was successfully performed on animals from the ages of four months to 13 years. The anesthesia produced in these cases was quite satisfactory and no deaths or undesirable side effects were experienced. Both dogs and cats were successfully anesthetized intravenously in this study.

Pharmacologic and toxicity studies of combuthal by Kingma, Spruth, Rieker, and Hollis were presented to us by the veterinary clinical investigation department of Abbott Laboratories, prior to clinical use of this new anesthetic. Preliminary studies by Kingma *et al.* included dosage, anesthetic duration and effect, recovery time, quietness of recovery, effect if preceded by preanesthetic agents and the margin of safety. Combuthal was found by them to be well tolerated, produced 25 to 45 minutes of anesthesia with good skeletal muscle relaxation. The recovery period was quiet, no excitation noted, and short (about 30 to 60 minutes duration). Although the margin of safety is wide, the usual precautionary measures should be employed as is the case when any anesthetic is administered. All of this was substantiated by clinical study.

Method of Administration and Preparation of Anesthetic Solution

Combuthal powder was supplied in 1 gm. rubber stoppered vials. A solution containing 0.5 gr. per cc. was made by adding 30 cc. of either sterile distilled water or isotonic sodium chloride solution.

The dosage was approximated on the basis of 1 gr. per 5 to 6 lb. of body weight. However, as with all anesthetics, each individual dog may require slightly more or less than another dog of equal weight. This was taken into consideration because age, general condition, obesity or leanness, and other factors may alter volume required to effect surgical depth of anesthesia.

Method of Administration

1. Weigh the animal and calculate the anticipated dose on the basis of 1 gr. per 5 to 6 lb. body weight.

2. Approximately one-half of the average calculated dose is administered rather rapidly intravenously—in about 30 to 45 seconds.

3. Approximately 30 to 60 seconds should be allowed to elapse before continuing the administration.

4. The remainder of the anesthetic required to effect the depth of anesthesia desired should be injected in small amounts (from 0.25 to 1.0 cc.) with a brief pause (15 to 20 seconds) before additional amounts are injected. This procedure is continued until the patient has reached the degree of anesthesia desired. Approximately 3½ to 5 minutes are needed to produce good surgical anesthesia.

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®[1]Combuthal is the registered trade name for a new anesthetic designed and offered by Abbott Laboratories, North Chicago, Illinois. This was supplied to us in 1 gm. multiple dose vials.

®[2]Parke, Davis & Co., Detroit, Mich.

®[3]Bilhuber-Knoll, Inc., Orange N. J.

The extent of depression in the patient being anesthetized is satisfactorily determined by employing the flexor, or so-called "toe pinch" reflex to a limb other than the one being used for injection. Also, the corneal reflex, the tongue reflex and rate and depth of respiration will help to determine the extent of depression.

For short operative procedures, 10 to 15 minutes duration, we found that a smaller dose produced satisfactory anesthesia.

In surgical procedures requiring longer period of anesthesia than produced by combuthal, nembutal solution can be used. There are times, however, when it is difficult to predict the time needed for completing certain surgical procedures. When this happens, the syringe containing combuthal can be taped to the leg and additional amounts may be administered if necessary to prolong the period of anesthesia.

Stability of Mixed Solutions

The recommendations for preparing combuthal solution were observed. We found that the solution retained its potency for as long as 14 days. Nevertheless, it is recommended by the manufacturers that solutions be stored under refrigeration and used within 48 hours whenever possible.

If the solution becomes cloudy or if crystals have formed, the remainder should be discarded. (These changes may be caused by inadvertent contamination or excessive exposure to carbon dioxide.)

Preanesthetic Agents May be Used

The greatest portion of this study did not include the use of preanesthetic agents. However, atropine sulfate and morphine sulfate in the usual dose can be used 45 to 75 minutes prior to the administration of combuthal. This proved quite satisfactory and reduced the dose of intravenous anesthetic by 1/3 to 1/2. However, preanesthetic sedation is not necessary.

Antidotes or Analeptics

We did not find it necessary to administer an antidote or an analeptic in any of the 233 cases studied. However, the manufacturers reported that the following antidotes may be used for inadvertent overdosage. Metrazol®* may be used in the dose of 1 to 3 cc. intravenously depending upon the size of the dog. Desoxyn solution may be given as an antidote in the dosage of 0.25 to 0.5 cc. intramuscularly or intravenously. Subsequent doses of either agent may be given 5 to 10 minutes later in cases of extreme depression. Picrotoxin 0.3% solution may be given in the dose of 1 to 2 cc. intravenously, depending upon the size of the dog. Subsequent amounts may be given 20 to 30 minutes later if necessary.

Conclusion

Combuthal was studied separately by the authors in 233 surgical cases. This anesthetic proved to be a highly satisfactory new general anesthetic for dogs and cats. It has advantages over products now available.

One dose only is required to produce 25 to 45 minutes of anesthesia. Thus, subsequent doses are not necessary, as is the case when using short acting barbiturates if a similar period of anesthesia is desired. However, a smaller dose may be given when performing minor surgical procedures which can be completed in 15 to 25 minutes.

The induction period was smooth, the period of anesthesia good to excellent, with good skeletal muscle relaxation lasting for 25 to 45 minutes. Recovery period was smooth and short (recovery in 30 to 60 minutes).

Combuthal may be used in conjunction with preanesthetic agents. This reduces the dose by 1/3 to 1/2 when given to effect. However, preanesthetic sedation is not necessary.

If surgery lasts longer than 45 minutes, subsequent doses may be given to prolong anesthesia. Combuthal fills a definite and immediate need in veterinary medicine.

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Trauma in Surgery

Degree of trauma may determine the quality of postsurgical recovery.

Planning procedures carefully prior to surgical invasion will tend to minimize error and possibility of excessive trauma with resulting delayed healing or recovery.—*Wayne Riser, D.V.M.*

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Tularemia is not a seasonal disease. Laboratory infections in man have been known to occur throughout the year. Natural human infections in the western parts of the United States occur most commonly during the summer months, and should probably be attributed to the bite of the deer fly. East of the Mississippi river human tularemia occurs most commonly during the rabbit hunting season.—*Timely Topics, Dec. 1955.*

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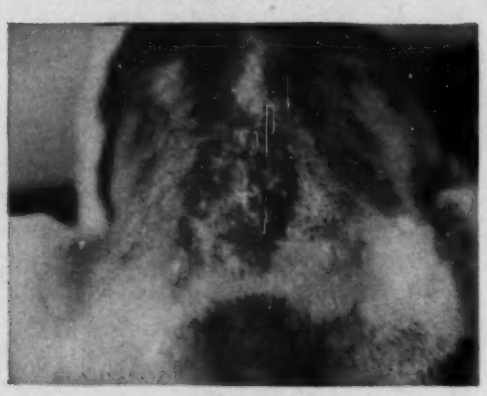

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Clinical Briefs and Notes†

Spinning line or leader line made of monofilament nylon used by fishermen serves as an inexpensive source of nonabsorbable suture material. It can be sterilized by boiling or by chemicals and used where sutures are buried or removed after healing. Test strength varies from 2 to 25 lb. according to size and is available at any hardware or fishing supply store. No sensitivity has been observed following its use.—*J. W. Peace, D.V.M.*

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A 5 cc. blood tube or unit rabies vial that is rubber stopped provides an excellent method of carrying or sterilizing hypodermic needles. Individual clean and sterilized needles are available and handy without contaminating others in a container large enough for a number of needles.—*J. W. Peace, D.V.M.*

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Glass or plastic tubes of various diamenter when cut to proper length make satisfactory vaginal specula. Tubes 3 in. long, ¼ in. diamenter are employed for toy breeds.—*J. W. Peace, D.V.M.*

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Simple Surger for Self-Sucking in Cows

Anesthesia is induced by injection of xylocaine® or 2% procaine at the base of the tongue lateral to the frenum. The apex of the tongue is then grasped with Allis tissue forceps, drawn forward and a tourniquet applied just anterior of the frenum. This serves both to hold the organ and controls hemorrhage.

An incision is made on the ventral surface beginning at the apex and continued posteriorly about ¼ in. from the lateral border to the tourniquet, then transversely to remove a triangular section. Edges are approximated by continuous suture using umbilical tape. These are not removed but come free in approximately seven days. Results have been satisfatory.—*William W. Cunningham, D.V.M.*

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Actual Cautery for Relief of Recurrent Patellar Luxation

Clip and other wise prepare stifle area for aseptic surgery. Under complete anesthesia introduce small needle-point electrode to the bone. The pattern should consist of 20 to 30 fired points at intervals of ¼ to ½ in. over the entire area. Cast is not necessary usually. Refire and cast two weeks later if indicated.

Ointments containing cod liver oil, such as desitin® ointment or an antibiotic ointment may be applied locally daily.—*B. W. Dawsey, D.V.M.*

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Use of Enzymes in Heartworm Therapy

Chymotrypsin has been tried in our practice for its effect on dead adult heartworms. To test efficacy, 18 dogs were employed. The first group of six were given six injections each of caparsolate® sodium solution, the second group nine, and the third 15 injections. Three animals in each of the three groups were given 100,000 units of chymotrypsin in 20 cc. of diluent and the remainder were given 1,000,000 units of 20 cc. diluent intravenously 24 hours following cessation of arsenical treatment. All enzyme injections were given rapidly excepting three animals of the third group which were injected by slow drip. Treatment in the latter instance required approximately three hours. No visual effects were noted on dead worms at autopsy 24 hours later.

Chymotrypsin does cause breakdown of dead worms *in vitro* after ten-hour exposure. No effect on live worms. It is of interest to note that breakdown of dead worms occurs by portions; the thinner portions gradually disintegrate into an opaque jelly-like masses, and the thicker remain in varying length. With this observation in mind, one case received three injections of 100,000 units of chymotrypsin in 20 cc. diluent on successive days with noticeably favorable results. *A. Soltys, B.V.S., V.S., Nassau, Bahamas.*

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Comment

"A monumental work which deserves to be preserved in every veterinary library for its historical value — the November 1955 number of VETERINARY MEDICINE celebrating that publication's 50th anniversary. It features discussions of all phases of veterinary progress by authorities of outstanding importance."—*Allied Veterinarian*, Jan.-Feb. 1956.

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†Presented at the 38th annual meeting of the Southern-Florida State Veterinary Medical Associations, Jacksonville, Fla., Oct. 16-19, 1955.

®Astra Pharmaceutical Products, Inc., Worcester, Mass.

®Desitin Chemical Co., Providence, R. I.

®Abbott Laboratories, Inc., North Chicago, Ill.

Question and Answer Luncheon

Dr. Floyd Cross, president of the A.V.M.A. presided at this meeting which gave opportunity to all to submit written questions to that group of speakers who had presented discussions so far on the meeting schedule.

Questions referred to Dr. Jacob Fine, professor of surgery, Harvard Medical School.

Q. Do you recommend as routine treatment, penicillin intravenously in accident cases?

A. In the event of a major injury or an open wound, I would suggest penicillin therapy. If wounds are severly contaminated, I would certainly advise penicillin. It is not necessary, however, to give it intravenously as it is absorbed rapidly on intramuscular injection.

Q. Does the administration of penicillin to two-hour shock patients at the time of transfusion shorten time of toxin death rate?

A. The nature of the question is whether or not an antibiotic reduces the toxicity of toxin. This point is now under investigation.

The answer is a tentative yes, but with certain alterations. If one administers toxin to either a normal animal or one in shock, the toxin is tied up in what we refer to as ameboid leukocytes and platelets in the bloodstream and also by nerve cells. That not neutralized probably kills. Just how it kills is an unanswered question. The matter is a complex problem of microbiology. I believe penicillin may deal with bacteria in circulating body fluids. If the antibiotic is given early, defense mechanisms are supported.

Q. Would you advise giving all major surgical patients penicillin? If so, at what time? What has been the general impact of antibiotics on surgery?

A. To the first portion, I would say yes from several points of view. One cannot produce the sterile environment quite so well in veterinary hospitals as is possible in human hospitals or surgical rooms. Cost is negligible. Secondary infection is more likely in a wound when not given, but lowered resistance of patients suffering wounds allows release of bacteria already in tissue to flourish. Penicillin is especially useful against Clostridium which do not build up penicillin resistance. Therefore, administration of antibiotic is likely to control at least some bacteria known to be always present in tissues.

Q. If an animal suffered apparent shock after administration of anesthetic, and surgical invasion is postponed, would penicillin in electrolyte solutions intravenously be of value supplemented by provisions for warmth?

A. If the shock was produced by the anesthetic one would think of barbituate poisoning rather than shock in the sense we are accustomed to think of it. Effort, of course, should be made to get the barbituate out of the system. Antidotes or detoxifying agents and efforts to clear it out of the circulation would be indicated. One might consider hypothermia rather than provision for warmth in such a case.

Q. Would a 15 to 16 gm. blood hemoglobin level infer a high level of properdin (antibacterial component)?

A. I believe that to be a fair assumption, but we are asking questions too fast for those investigating the subject. The level of hemoglobin mentioned suggests good health and adequate nourishment so that the properdin level would be expected to be normal.

Q. In the case of an animal presented in traumatic shock of 30 minutes to one hour duration, is an antibiotic indicated routinely? If so, which one is recommended?

A. I would say decisively the antibiotic would be indicated routinely, promptly and in quite sizeable quantities. Intravenously is the method of choice in this instance, because the animal is in shock or going into shock. Intermuscular or subcutaneous injection would be absorbed too slowly in such a patient. I would prefer in most cases a combination of penicillin and streptomycin.

In the event the intestinal tract has suffered injury, antibiotic administration intravenously and *per os* might be recommended. Bacitracin and neomycin would serve well in such a case. Results would not be apparent for 12 hours or more. A combination of penicillin and streptomycin would be effective against bacteria already in the tissues and these given by mouth would be protective if further invasion is anticipated.

Q. What part does keeping the patient warm play in the treatment of shock?

A. Sometime ago heat was recommended; now such practice is avoided.

It appears obvious that the more heat applied the greater the rate of metabolism at a time when the body is unequal to such a demand. Hypothermia has been referred to here as having saving effects and heat should not be added under any circumstances except under conditions of severe body heat loss.

Prevention of loss of body heat may not have value now claimed. Advantages are now perceived of reducing body heat to 28 C. in order to conserve tissue. An animal is probably better off at low temperatures under ordinary circulation, and in summer, heat might be extracted to advantage.

Q. What about timing the cooling and antibiotic treatment of a shock patient?

A. Measures including use of antibiotics or hypothermia have prophylactic effect on shock but most is lost once shock is present or soon thereafter. The reason for failure of antibacterial agents and cooling to be effective is because once shock is present, toxins are being generated. The quantity of such toxins that would be harmless under normal conditions may be lethal to a shock patient.

The best that can be done under circumstances of advanced shock is to hope that toxins already generated will not constitute a lethal dose and restore normal tissue function as rapidly as possible by blood volume, sepsis, and wound debridement and treatment.

Even an apparently trivial wound may be dangerous to an animal in shock.

Q. What is the relation of hypothermia to recovery from anesthesia?

A. Hypothermia without anesthesia is not satisfactory because of shivering. No animal should be allowed to tolerate that because it is too much of a burden and rather cruel if forced without anesthesia. First use a rapidly dissipated anesthetic to avoid complications, then get body temperature down to 28 C. At this point patient is anesthetized with cold which will continue as long as body temperature is maintained at this low point.

Q. What of the use of agents that allegedly seal capillaries for shock due to loss of vascular fluids?

A. When the capillaries are sealed, exchange between blood and tissues is hampered or lost and in extreme cases such interference with exchange is fatal.

Q. What is the chemical nature of properdin?

A. Properdin is a protein substance. It has a high molecular weight higher than fibrinogen though not accurately determined. Pure properdin has not been prepared, therefore not subjected to analysis. We assume that it is probably not greatly different from the kind of amino acids that make up its configuration. The interesting bacteriolytic behavior of properdin is due to its capacity to bind certain substances in the cell walls of certain red cells, of yeast cells, and bacterial cell walls. A certain folic acid arises. This special property of properdin points to a molecularization in the walls of bacterial, red blood, and yeast cells alike. There is much mystery to be revealed of the properties of this substance.

Q. Should heparinized blood be transfused in treatment of shock?

A. Heparinized blood should not be used. Citrated blood is recommended.

Q. Are bacterial toxins likely to be released and cause death in a dog suffering rattlesnake venom?

A. Possibly. If snake venom acts by injuring the antibacterial defense mechanism, antibiotic treatment would be indicated.

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Questions directed to and answered by Dr. O. D. Grace, Morton Grove, Illinois.

Q. Discuss action of calcium supplied with blood transfusion.

A. The addition of sodium salts to blood collected to be stored for indirect transfusion is prevention of coagulation by tying up the calcium ion. There is ordinarily an excess of sodium citrate in stored blood and possibly enough to interfere with coagulation in the recipient patient. I can see no reason why it would be undesirable to administer calcium gluconate or similar preparations either simultaneously with, or following, blood transfusion.

Q. Is there merit to subcutaneous administration of electrolytes?

A. Benefits are derived from electrolyte solutions administered either intravenously or subcutaneously. If given intravenously exercise care to avoid too rapid a rate of flow. The subcutaneous route has both advantages and disadvantages and though rate is not so important a consideration, gravitation may cause problems of absorption and conceivably produce necrosis. Nevertheless, we do not always have a choice, and subcutaneous administration may offer the only practical route for a number of reasons. Under such circumstances and when fluids are indicated, subcutaneous administration is recommended.

Q. Does the presence of microfilaria of the dog heartworm make unusable blood from an otherwise healthy dog whose hemogram is within the normal range?

A. Certainly choose a healthy donor. Microfilaria life in stored blood may determine the

advisability of using blood from a parasitized animal.

Questions referred to Dr. Wayne Riser, Skokie, Illinois.

Q. Recommend treatment for six-to seven-month-old Boxer male with an undescended testicle palpable at the external inguinal ring.

A. Cryptorchism is believed generally to be a congenital defect. Owners of such animals usually wish to breed these dogs because of superior conformation and for this reason we do not recommend treatment. Congenital defects should not be corrected in breeding stock if we are sincere in efforts to breed toward hereditary perfection.

Q. What are the hazards of passing stomach tubes via the nasal route in cats?

A. It is a regular procedure at our hospitals. Hazards are not serious if the technic is carried out with ordinary care. French urinary catheters, size seven or eight, serve well and may be passed with ease if directions as published are followed (see VETERINARY MEDICINE, 45:407 [Oct.,] 1950). The size of the lumen limits the tube's usefulness in emptying the stomach but does serve an excellent purpose for administration of medicine and for feeding. Cats ordinarily do not resist the stomach tube in position through the nasal passages.

Questions referred to Dr. C. Lawrence Blakely, Boston, Massachusetts.

Q. Give treatment for multiple recurring sebaceous cysts.

A. Surgical drainage, cautery and local treatment is the only method of handling such cases satisfactorily.

Q. What problems are likely to arise in over-oxygenation of dogs?

A. We have not observed toxicity by over-oxygenation employing 100% oxygen continuously for periods of two to three hours' duration.

If a mechanical respirator is used, one is faced with the problem of hyperventilation. Carbon dioxide in such a case may be washed out to such an extent that the patient will not breathe after the respirator is stopped. Preferred is not to hyperventilate, but use the respirator at such level where respiration is controlled and not exceeded. Carbon dioxide may be used following oxygen therapy but is not necessary if care is exercised.

Q. Describe treatment for rupture of the tendon Achilles at point of origin.

A. The tendon Achilles originates in the belly of the gastrocnemius muscle which, in turn, takes its origin at the posterior surface at the distal end of the femur.

Ruptures at this point are rare. In such event, surgical repair would be indicated according to approved technics for suturing the tissue, then applying a Thomas splint or otherwise immobilize structures with the hock and stifle in extension and relax tension of the gastrocnemius muscle. Maintain splintage for two to three weeks until complete healing. If, as sometimes happens, the tendon has ruptured at the point of insertion on the os calcis, the problem of what to anchor the tendon is presented. Care in providing anchorage to that portion of the tendon remaining, the periostium and around or through os calcis may provide sufficient anchorage.

Questions referred to Dr. K. W. Smith, Sioux City, Iowa.

Q. Is novocain contraindicated in dogs?

A. No. The local anesthetic agent will do as well as procaine.

Q. What are the ill-effects of epidural anesthesia?

A. Several ill effects may follow use of epidural anesthesia. Dangers exist of too large doses which conceivably might anesthetize nerves to vital organs. Shock also may be considered a possible unfavorable sequellae.

Too rapid administration should be avoided, which might influence sudden pressure changes on cerebrospinal fluids. Occasionally unexplained hemianesthesia occurs following epidural injections.

Questions referred to Dr. W. F. Riley, East Lansing, Michigan.

Q. Should antibiotic treatment of listeriosis in cattle be reported?

A. Routinely we administer 5 gm. aureomycin intravenously to an adult cow of 1000 lb. or more the first day and 2.5 gm. per day for two or three days afterward. In addition we are using sodium iodine intravenously at the rate of 15 to 20 cc. per 100 lb. body weight of the commercial parenteral solutions.

Q. What of the newer antibiotics have proved most useful in the treatment of bovine metritis?

A. A number of new combinations of antibiotic agents have proved satisfactory in our

(Continued on page 192)

Corticosteriod in the Treatment of Certain Equine Lamenesses

ROY DILLON, D.V.M., Oakland, California

The treatment of traumatic arthritis constitutes a considerable portion of Thoroughbred practice. Until recently, methods have been based primarily on the employment of counterirritation. Firing (actual cautery), blistering, and painting with skin irritants have been used for many years and are still popular in certain cases refractory to other therapy. Use of *x*-ray, radio-active isotopes, and ultrasonic waves are being employed presently in a limited way with variable success. Corticosteriods have been proved useful in recent field tests in certain types of lameness.

Pharmacology of Corticorsteroids

Corticosteroids are hormones or hormone-like substances (synthesized adrenal steroids) chemically and physiologically identical to products secreted by the adrenal gland. One of these is the 9- alpha fluoro derivative of hydrocortisone (compound F) synthesized by the laboratories of The Squibb Institute for Medical Research. The product is known by the brand name of fluorohydrocortisone®.

Fluorohydrocortisone* exerts pharmacologic effects similar to those of other corticosteroids, although usually its activity is considerably more marked than is that of other compounds available. Swingle and his co-workers have reported it to be from 4.9 to nine times as active as hydrocortisone in maintaining life of adrenalectomized dogs[1]. Action is determined as marked adrenocortical and pituitary inhibition, influence on liver glycogen, thymus involution, and sodium excretion. The hormone is indicated in the treatment of Addison's disease and adrenal hyperplasia in man.

Clinical Reports

Case 1. A five-year-old Thoroughbred gelding in good condition was presented with the right front fetlock joint swollen and hot. Pain was elicited on pressure over the joint. Dorsal extension of the joint capsule was distended and tense on palpation. The condition had existed for 12 months. Diagnosis—traumatic arthritis, uncomplicated.

Treatment. Approximately 35 cc. of sanguineous synovial fluid were withdrawn from the joint capsule and 5 cc. (25 mg.) fluorohydrocortisone injected.

Within four hours following injection, the joint capsule became distended, heat was apparent, and the patient evidenced severe distress. Foot was held off the ground and pain manifested by accelerated respiration, profuse sweating, and muscle tremors. Owner reported distress symptoms of 18 hours duration. Fair improvement followed, which was transient. Joint was less painful and heat had dissipated somewhat ten days postinjection. Some moderate swelling returned.

Case 2. Three-year-old Thoroughbred filly evinced heat, swelling, and pain in the right carpal joint, which was distended. Pain was marked on slow exercise. The condition was reported to have existed for eight months and had been treated previously by counterirritants. Diagnosis—uncomplicated, traumatic arthritis.

Treatment. Intra-articular injection 5 cc. (25 mg.) fluorohydrocortisone. Within two days symptoms of inflammation had subsided and the filly ran well with no evidence of lameness or pain.

Case 3. Four-year-old Thoroughbred stallion in good physical condition was presented with right front fetlock joint swollen and hot. Pain evident on walking. Dorsal extension of joint capsule was distended and tense on palpation. Previous treatment—local counterirritation. Diagnosis—arthritis, probably of traumatic origin.

Treatment. Ten cc. of synovial fluid were withdrawn and the patient given one injection of 5 cc. (25 mg.) fluorohydrocortisone intra-articularly, followed by application of a pressure bandage. Three days post-treatment swelling had subsided and, on exercise, there was no evidence of pain. This animal has remained free from symptoms of lameness to date.

Case 4. Five-year-old Thoroughbred gelding presented with carpal joint lameness of 18 month's duration. Both legs were involved. Considerable exostosis was apparent in both right and left carpal joints. Previously treated by counterirritation.

Treatment. Intra-articular injection of fluorohydrocortisone 5 cc. (25 mg.) on July 8, July 24, August 8, and October 4, 1955. There was transient remission of symptoms following each injection lasting for variable periods.

Case 5. Four-year-old Thoroughbred mare exhibited symptoms of tenosynovitis claimed to be of 16 month's duration. Counterirrita-

*The fluorohydrocortisone intra-articular suspension used in these studies was furnished through the courtesy of E. R. Squibb & Sons, New York, N. Y.

tion had been applied without results. A large, pendulous mass could be palpated over the carpal region of the left foreleg. It appeared to enclose the tendon of the extensor carpi radialis.

Treatment. The sheath was tapped and 80 cc. of synovial fluid, normal in color and consistency, were withdrawn. Immediately following 5 cc (25 mg.) fluorohydrocortisone were injected and treatment repeated four days later. There was apparent remission of synovial effusion after the second treatment. Three days following second drainage and injection treatment the tendon sheath appeared normal, and when last seen (about four weeks after the final treatment) tendon sheath was apparently normal and the animal appeared to be sound.

Tentative Conclusions

Fluorohydrocortisone has been used on a limited number of arthritic animals with encouraging results. Therapeutic effects of the hormone were dramatic whenever it was used in the less severe, acute cases. Obviously, where exostosis produced a mechanical obstruction to free articulation, relief afforded by treatment was transitory. One case of tenosynovitis which had existed for months responded to injection of two 25 mg. doses. In most cases of carpal or fetlock joint capsule involvement, a dose less than 25 mg. appeared insufficient. In several cases, treatment had to be repeated at intervals to maintain relief of symtoms of lameness.

It is probable that had selected cases that proved refractory been taken out of training during treatment, results would have been more satisfactory. In using fluorohydrocortisone, it seems proper to caution the owner or trainer that its use does not constitute a "cure." It was observed by Wheat[2] that when using these agents, if an animal is not given adequate rest periods, the underlying cause of inflamation may cause a complete breakdown of the injured parts.

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2. Wheat, J. D., Use of Hydrocortisone in the Treatment of Joint and Tendon Disorders in Large Animals. *Jour. Am. Vet. Med. Assn.*, 127:64 (July), 1955.

(*Continued from page 190*)

hands. Of course, selection would depend on the type of infection. For the chronic type of low-grade infection, penicillin and streptomycin, tyrothricin and neomycin with polymixin B sulphate have proved therapeutic value. The oldest of these treatments, tyrothricin, has much to commend it for field use.

Q. Explain use of quaternary ammonia compounds for treatment of diarrhea in stabled cows?

A. We use quaternary ammonia compounds routinely on the entire herd whenever outbreaks occur. In these cases, only a few of the animals appear to be suffering a severe diarrhea, others may be noted, on close examination, to have gone off feed and dropped volume of milk production.

Only adults are treated.

From 4 to 6 oz. of commercial quaternary solutions are added to one gallon of water and 4 to 6 oz. of the resulting solution is given twice daily for one or two days as indicated. Often a single day's treatment is sufficient except for those affected severely.

Questions referred to Dr. Fred Kingma, North Chicago, Illinois.

Q. Explain the use of procaine solution for ventricular fibrillation?

A. Procaine as a 1% solution is not as toxic as agent for the dog as believed earlier. Recommended dose for control of ventricular fibrillation is approximately 5 to 10 cc. injected preferrably into the left ventricle.

Q. What is the recommended dosage of atropine in the dog?

A. Dose recommended is 1/150 to 1/75 gr.

Q. Explain the stimulating effect of 50% glucose during recovery from prolonged barbital anesthesia.

A. The physiological response to excess glucose is release of epinephrine. Small amounts have a depressant effect.

Q. Would preoperative feeding of low-fat foods be desirable before administration of short-acting barbiturates. How many feedings are required to produce adequate liver protection?

A. Reinforcement of the functional integrity of the liver is desirable preoperatively if practical. High quality protein and carbohydrates may be fed or special protein preparations and glucose may be given *per os* or intravenously if it is considered necessary to support the function of the liver to detoxify parenterally administered barbituates.

EDITORIAL COMMENTS

Favors Mandatory Poultry Inspection

A resolution favoring the careful development and adoption of state and federal mandatory inspection for wholesomeness programs for all poultry and poultry products has been adopted by members and the board of directors of the Institute of American Poultry Industries, according to an announcement made jointly by Paul C. Gray, Jr., Estherville, Iowa,, chairman of the board of the Institute,, and Dr. Cliff D. Carpenter, president.

The resolution, as approved by Institute members, reads: "The Institute of American Poultry Industries continues to encourage and support one of its chief, original objectives, namely; the utilization of every sound means to give the consumer a better product and the producer a better market.

"In furtherance of this long-standing objectiev of the Institute,, its Board of Directors and its members favor the development and adoption of sound, mandatory inspection for wholesomeness programs for all poultry and poultry products, provided such programs are paid for from federal and state funds."

The Institute is a national trade association of poultry and egg processing and marketing firms, representing 1800 member plans. Now in its 30th year, the Institute continually has made sanitation and wholesomeness an important part of its work program. Four years ago, it initiated with the Public Health Service a study of poultry processing plant sanitation. This led to the publication in 1955 of a Uniform Poultry Ordinance by the U. S. Public Health Service to serve as a model for state and local governments in enacting their own ordinances.

Currently, on a voluntary basis, about 25% of total poultry meat is under U. S. Department of Agriculture inspection for wholesomeness.

"Because our industry is now doing much of the work the housewife used to, we must, of course, be 'kitchen-clean' according to Doctor Carpenter. As a matter of fact, our members pride themselves on the cleanliness of their plants. Since however,, the housewife is buying and accepting greater services from industry, it is necessary not only for poultry to be wholesome—but also for the housewife to be convinced of this fact and to have no reason to question the wholesomeness of the poultry she buys, regardless of its source. As an industry, we want to see that the housewife has whatever added assurance she needs to keep her consuming and enjoying poultry products at a maximum rate."

It has clearly been recognized that the benefits derived from red meat inspection have been enjoyed by the public generally and that the cost of such inspection, except overtime inspection, should be paid for out of appropriated funds. Since the purposes of poultry inspection and the benefits to be derived therefrom are the same as those for red meats, the cost of such mandatory programs for poultry, when developed, should be paid for from federal and state funds, as in the case of red meat.

Cancer Research

Training viruses to grow on selected cancer cells is being explored by scientists at the National Institute of Health. A report appearing in the current issue of *Medical News* states that investigations had revealed that adenoidal, pharyngeal, conjunctival (APC) viruses could be grown on HeLa cells and that they destroyed them. Since such cells originally came from a human cervical cancer, the researchers immediately considered the possibility that they be useful in inoperable cervical cancers. Subsequent clinical studies have confirmed this theory through immunity responses of the cancer cells depress effectiveness of the viruses. Workers are encouraged to pursue the work, however, in an all out effort to explore facts so far established.

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Viscera Larvae Nigrans

Viscera larvae nigrans designates a new human disease caused by larvae of canine roundworms. It has been believed generally that the dog ascarid *Toxacara canis* was strongly host-specific as is generally true of most parasites. Now, investigation supports the belief that while larvae of this parasite do not mature in man, they will migrate to the liver or brain where they are eventually walled-off by "capsules" of tissue. The condition has been described as occurring in young children.

Iowa Veterinary Diagnostic Laboratory

Construction work on the new facility (architect's drawing below) on the campus of the Iowa State College, Ames is nearing completion and occupancy is scheduled for late spring.

The new building measures 225 ft. by 43 ft. and forms a connecting link between the wings of the present veterinary quadrangle which houses the Departments of Pathology and Anatomy. The Diagnostic Laboratory provides five or six times the floor space now available in the Department of Pathology wing of the quad building. This will permit operation of some diagnostic technics and procedures not now conducted or undertaken only on a limited scale. At the same time all of the services now performed including work in bacteriology, pathology, virology, parasitology, serology, histopathology, and mycology can be expanded and put on a more routine basis without interfering factors inherent in present limited facilities. Laboratory space for additional personnel also will be available.

Dr. Paul C. Bennett, professor and supervisor of the Iowa Veterinary Diagnostic Laboratory states that the new facilities will make possible complete diagnostic service for veterinary practitioners for service to the state's livestock industry.

A portion of the space in the new building will be used by the Departments of Hygiene and Pathology.

Plans are now being formulated for a short dedication program to be held during the Annual Conference for Veterinarians to be held in July 1956.

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Listeriosis has become a problem in beef and dairy cattle in some sections.

"Veterinarian of the Year"

Dr. W. W. Armistead, dean of the School of Veterinary Medicine, Texas A. and M. College, College Station, was voted veterinarian of the year by poll of the profession by the Gaines Dog Research Center, New York City.

Dean Armistead received his "Fido" in absentia at the presentation breakfast in New York at which time similar recognition was given leaders among those interested in breeding and showing purebred dogs.

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Causes of Death in Chinchilla

Intestinal diseases and those involving the lungs were predominant causes of death of chinchilla as determined by autopsy of 1000 specimens according to Brenon *Jour. Am. Vet. Med. Assn., 126: 222*(Mar.), 1955. Correction of faulty feeding practices and careful use of cooling and heating systems may be expected to reduce mortality among these animals.

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Tuberculosis Eradication in Sweden

The incidence of bovine tuberculosis as determined by postmortem examination at slaughterhouses in Sweden has dropped from approximately 30% in 1937 to 0.2% in 1954. An active eradication campaign is continuing on a nationwide basis. It is reported also that only 0.09% of retested cattle now react to the intradermal test.

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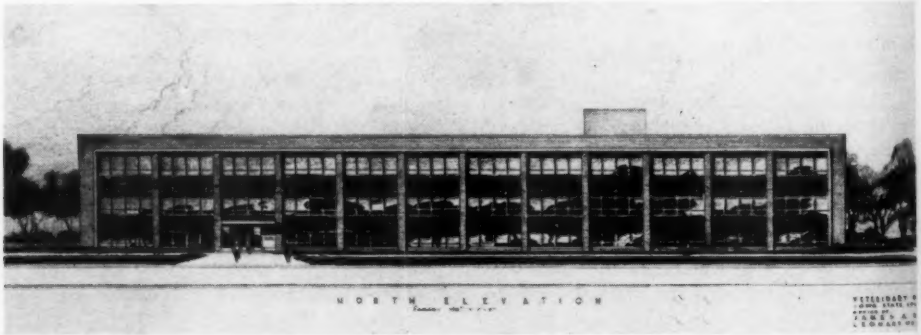
Only 2% of 300,000 known plants are extensively cultivated and only two of these, corn and soybeans, have been intensively investigated to determine potential use and value. —*Charles N. Kimball, D.Sc.*



Stilbestrol Pellets for Feeder Cattle

Poultrymen have been using stilbestrol pellet for chemical caponizing action for several years. Now, the Food and Drug Administration has approved the marketing of stilbestrol in pellet form for use on feeder cattle. Recommended technic of implantation employs the poultry implanter for depositing pellet under the skin of an ear.

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New York State Agriculture Department clamped a rigid state quarantine on all bovine brucellosis reactors so that they can not be transferred from farm to farm. Plans have also been made to vaccinate all calves between four and eight months of age as a portion of the Brucella eradication plan.

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Milk production during the first nine months of 1955 was 97,400,000,000 lb. compared to 97,200,000,000 lb. in the same period during 1954. Production per cow also was up 5%. —*Hoard's Dairyman*, Nov. 10, 1955.

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Patent on Chick Sexing Method

Poultry scientist, William Seltzer, of New Jersey has been granted a patent on a method of treating eggs to control the sex of baby chicks, according to report in the current issue of *Farm Journal*.

Fertile eggs are wet in either solutions containing estrogens or androgens depending on sex desired. The patent holder claims 98 to 100% predetermined results on incubation of thousands of treated eggs. Absorption through shell pores of the dissolved hormone is sufficient apparently to influence sex of the developing embryo.

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Doctor Moss on Foreign Tour

"So far (January 13, 1956) we have visited 23 veterinary schools in Great Britain and continental Europe," writes Dr. Lloyd C. Moss, Colorado A. & M. College, Ft. Collins. This communication was written enroute to Capetown, South Africa aboard the M/S Trianon. He also supplied the two photographs of personalities of veterinary schools at Zurich and Lisbon (see captions accompanying photos).

Members of the faculty of the College of Veterinary Medicine, University of Zurich, Switzerland. L. to r.—Prof. Andres, Head, Ambulatory Clinic, Prof. E. Hess, Head, Department of Bacteriology, and Prof. W. Leemann, Dean (Dekan) and Head, Medical Clinic. Professor Leemann was elected Dean for 1954-1956. Professor Hess held the position for two years previously. Zurich has plans for a $3,500,000. veterinary school. The buildings should be completed within the next few years.

At Escola Superior de Medicina Veterinaria, Lisbon, Portugal. L. to r.—Dean, Prof. Augusto Obreu Lopes, Doctor Moss, and Jose Lino de Sousa, Treasurer. The school is part of the (University Tecnia) Technical University of Lisbon; was established in 1830 and has been a separate school since 1911. Enrollment now numbers 140 students in the five-year course. It is the only veterinary school in Portugal.

Rinderpest in Africa

On review of a large group of scientific papers on rinderpest, three important facts have emerged, according to Annual Report of the Department of Veterinary Services, Colony and Protectorate of Kenya, Africa. They are:

"(1) Every rinderpest outbreak in a previously rinderpest-free country has been traced to the introduction of live animals.

"(2) Natural transmission is by droplet infection. There is a negligible risk of infection from contact with infected material unless conditions exist which are favorable to aerosol spread.

"(3) Modern methods of storage and transportation of carcasses will not affect the viability of rinderpest virus despite storage periods of several months."

Postgraduate Training in Veterinary Mycology

A course in laboratory diagnostic methods employed in veterinary mycology was presented at the Communicable Disease Center Laboratories in Chamblee, Georgia, December 12-16, 1955. The course included discussions of the types and prevalences of mycotic infections of animals and man. Considerable time was devoted to mycotic skin infections as well as to related systemic diseases.

Subjects treated were ringworm, histoplasmosis, coccidiodomycosis, blastomycosis, and aspergillosis. Those attending the course were photographed during sessions (see below).

The next course to be offered by the Communicable Disease Center is scheduled for December 1956.

Front row: (left to right) Dr. Libero Ajello, Chief, Mycology Unit, Communicable Disease Center, Dr. Howard Levin, U. S. Department of Agriculture, Mrs. Margaret Ann Robinson, Ala. Polytechnic Institute, Auburn, Miss Callie Papageorge, Mycology Unit, Communicable Disease Center, Mrs. LaVerne Camp, Mycology Unit, Communicable Disease Center, Dr. Lucille K. Georg, Mycology Unit Communicable Disease Center, Dr. Phillip H. Cochran, Kentucky State Health Department, Dr. John H. Richardson, Florida State Health Department (Assigned by CDC). Second row: (left to right) Dr. Robert G. Bramel, Sharpe & Dohme, West Point, Pa., Dr. Salem G. Fine, U. S. Department of Agriculture, Dr. John F. Winn, Communicable Disease Center, Dr. Jerry A. Theobald, Practitioner, Cincinnati, Ohio, Dr. Leland E. Starr, Georgia State Health Department. Back row: (left to right) Dr. Paul J. Brandly, U. S. Department of Agriculture, Dr. James H. Steele, Communicable Disease Center, Dr. John W. Davis, North Carolina State Dept. of Agriculture, Dr. William Kaplan, Mycology Unit, Communicable Disease Center.

PRINCIPLES OF ANIMAL HEALTH

R. R. DYKSTRA, D.V.M.
Manhattan, Kansas

Euthanasia

A new British publication, *Veterinary Reviews and Annotations*, Vol. I, Part I, contains amongst other items, an informative discussion about euthanasia—from the Greek meaning "well death," or as it is most frequently interpreted "painless death." In the article about enforced death of domesticated animals, various methods are presented with objective of having the end take place "without antemortem associations of fear or pain." Unconsciousness before actual slaughter is desirable. Mostly this is accomplished by injury to the brain by stunning with a pole-ax, sledge-hammer, or electrically. With the sledgehammer, as performed in most cattle slaughter in American packing plants, it is not uncommon to have the animal painfully injured by a misdirected blow. In some countries where it is used, the captive bolt and the free-bullet type of stunning devices are decided improvement over the pole-ax or sledge. Electrical stunning is also used, but requires an experienced operator and the voltage may necessarily need to be altered because of heavy hair-coat, mud-soiled parts, and other factors. Insufficient voltage does not produce unconsciousness, and excessive voltage produces blood splash in the meat. Finally, after these preliminary steps death, in meat producing animals, is by bleeding. Electrical stunning and final bleeding is now approved in some countries in the production of kosher meat.

Birds are almost painlessly killed by neck-breaking; though there may be brief fear, when the hooked knife introduced through the mouth simultaneously punctures the brain and severs blood vessels. Another method employed in the slaughter of large animals, is the quick complete severing of the spinal cord by means of a double edged knife plunged through the atlo-axoid space while the animal's head is strongly flexed. In the dog, an electrical current properly applied produces an irreversible cardiac fibrillation and death, though in the cat fibrillation is reversible so that the apparently electrocuted animal may recover. If the brain is in the course of a sufficient strong electrical current unconsciousness and death are the result. The use of drugs such as strychnine is condemned as the animal is conscious during the inspiratory muscular spasm. A saturated solution (it must be saturated) of magnesium sulfate intracardially or intravenously is recommended for dogs, as are the barbiturates. The latter group to be followed by bleeding during unconsciousness. Volatile anesthetics in dogs, such as chloroform is preceded by an excited stage which makes it undesirable for these animals, though reasonably satisfactory for cats. Drowning newly-born puppies or kittens is not euthanasia; it arouses fear during the conscious period. A pentobarbital is advisable. (The preceding is mostly a review of the article entitled Euthanasia in *Veterinary Reviews and Annotations.*)

The American Animal Welfare Institute in its November-December 1955 report comments favorably on the method of making swine unconscious previous to slaughter by causing the animals to pass through a tunnel the atmosphere of which in its lower portions is charged with 65% concentration of the heavier than air carbon dioxide (CO_2) gas. Within a few seconds,, without preliminary struggle, the animal becomes unconscious so that the usual bleeding and scalding may be practiced. These tunnels are used in the Hormel plants at Austin, Minn., and Fremont, Nebr. "Studies on the PH of meat from pigs which have been stunned electrically and those which have been made unconscious with CO_2 revealed the latter to be the same as that from unstunned pigs and better from the point of view of long-term keeping qualities."

Countries having humane compulsory slaughter laws are England, Scotland, Northern Ireland, Switzerland, The Netherlands, Denmark, Norway, Sweden, Finland, New Zealand, and parts of Austria, Germany, and France.

A research project in one institution concerns itself with a study of rapid decompression as a means of humanely disposing of unwanted animals. It is stated that placed in the evacuation chamber the animal "blacks out" in a matter of seconds with a minimum of apprehension and painlessly expires in a few minutes.

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Trends in livestock feeding is to increase both energy and protein content of rations.

VETERINARY NUTRITION

MORRIS ERDHEIM, D.V.M.
Chicago, Illinois

Correction

In a discussion of preventive measures for milk fever, appearing on this page (VETERINARY MEDICINE, 51:140 [Mar.], 1956), three methods were outlined. The third was incorrectly given as the oral and intramuscularly use of dihydrocholesterol. What was intended was the product dihydrotachysterol, an oil-soluble steroid (synthetic hormone) obtained by irradiating ergosterol.

This product is made available in the United States by the S. E. Massengill Company, Bristol, Tennessee and is marketed under the brand name, parterol®.

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Dicalcium Phosphate Best Phosphorus Source for Cattle

At the Oklahoma Formula Feed Conference held October 27, 1955 at Stillwater, Oklahoma, Nelson of the Animal Husbandry Department, reported that colloidal clay is not as good source of phosphorus for cattle as dicalcium phosphate. Cattle fed similar diets did not do as well when colloidal clay was used as the sole source of phosphorus. They exhibited rough hair coats, crooked long bones, pica, and made poorer gains than did the control group which was fed dicalcium phosphate. Moreover, the colloidal clay group was stiff gaited. Autopsy revealed erosions at the joints and exostosis on the long bones.

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Feather Meal and Poultry By-products

Combs, of the University of Maryland reported at the 1955 University of Minnesota Short Course on the successful use of feather meal and poultry by-products meals in poultry rations. The protein of both products is apparently readily available to the chick. Feather meal protein is not complete and must be supplemented with additional amino acids. Combs added supplemental amounts of histidine, lysine, tryptophane and methionine. With the addition of these amino acids the growth rate and feed efficiency of chicks fed rations containing feather meal compared favorably with the control group receiving the same levels of protein supplied by other ingredients. Under practical conditions no more than 2.5% of feather meal can be used in starting feeds for poultry without decreasing the overall amino acid quality of the ration.

Poultry by-products meal, on the other hand, may be used safely at levels from 5 to 10% in most rations without difficulty. The protein content of this material ranges from 55 to 57%, and the fat content may be as high as 14%. Unlike feather meal protein, the protein in poultry by-products meal is of reasonably good amino acid makeup.

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Liquid Cattle Feeds

Some interest has been shown in recent months in a molasses-urea combination for cattle feeding. The urea supplies nitrogen for protein synthesis and the molasses source of energy. At least one such product also contains vitamins and trace minerals.

Recent work by Richardson of Kansas State College suggests that phosphoric acid can be used effectively as a source of supplemental phosphorus in beef cattle rations. Phosphoric acid is included easily in molasses mixes. It is said to have an additional advantage in liquid feeds. It tends to repel flies which the molasses attracts.

These liquid feeds are designed to be fed as supplements in addition to grains and roughage. Only time will tell how successful they will be under every day feeding operations.

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At the Kansas Formula Feed Conference held at Manhattan January 9, 1956, Dr. Lane Moore of the USDA Dairy Research Branch reported cattle suffering from vitamin A deficiency may appear to be in good physical condition. Ophthalmascopic examination of the eye is a simple test which results in a definite diagnosis.

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Unidentified growth factors are simply unidentified vitamins.—*J. Russell Couch, Ph.D.*

POULTRY PRACTICE PROBLEMS

W. R. HINSHAW, D.V.M., Ph.D.
Frederick, Maryland

Animal Fats in Poultry Rations

Stabilized animal fats are being used successfully in high energy poultry feeds. Fats which have in recent years become a surplus commodity have been found to give satisfactory growth response and to improve physical characteristics when used in high energy poultry feeds. A review on the use of fats in poultry feeds and their influence in rations on storage quality in broilers is given by Darrow and Essary (*Poultry Sci.*, 34:427, 1955). Fats used in these experiments included both animal and vegetable fats (tallow, cottonseed, and soybean fats). These added to 5 to 10% of the rations did not adversely affect storage quality of poultry held at 0 F. or lower for nine months.

Another paper which reviews this subject and reports on different grades of animal fats on performance of chicks is that of Seidler, Scheid, and Schweigert (*Poultry Sci.*, 34:411, 1955). Their results indicate that fats properly stabilized are utilized equally well regardless of the free fatty acid content. Foods and caloric efficiency data showed excellent utilization of choice white grease, yellow grease, brown grease, and a fatty acid preparation when fed at 3% levels. Some reduction of caloric efficiency was noted when a 6% level was fed. Their results agreed with those of Darrow and Essary, that the fats used did not affect eating quality.

A third recent reference on animal fats relates to their value in broiler rations. Slinger, McConachie, and Pepper (*Poultry Sci.*, 34:789, 1955) used stabilized animal fats at the rate of 5% of the ration, and found that the efficiency of feed utilization was enhanced by the inclusion of animal fat.

These and numerous other references that have been published during the past year or two have influenced feed processors to include animal fats to poultry feeds as a routine procedure. Many problems have, however, been introduced by this practice. One is the problem of rancidity control, and the need to use stabilized fats is emphasized by nutritionalists. The nature of the fat used and the composition of the diet other than the fat may influence the results. For example, March and Biely (*Poultry Sci.*, 33:1069, 1954) found that the dietary requirement for folic acid was higher when the rations contained 5% of certain fats.

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Pheasant-Turkey Hybrids

Asmundson and Lorenz (*Science*, 121:307, [Feb.] 1955) have reviewed the literature on pheasant-turkey hybrids and reported their results with artificial insemination of ring-neck pheasant and turkey crosses. In 1952, following artificial insemination of pheasant hens with bronze turkey semen, at least ten fertile eggs were obtained. Six of the embryos survived two weeks or longer, and two were alive on the 24th day of incubation but did not hatch.

In 1953 and 1954, reciprocal matings were made on a more extensive scale. Early embryo mortality was high but most of them that survived ten days incubation survived to 24 days. In 1953, 11 and 13% of fertile eggs of the pheasant-turkey and turkey-pheasant crosses, respectively, hatched. In 1954, the percentage was somewhat higher. The intergeneric hybrids, like those from the pheasant and domestic fowl, are apparently sterile. The survival of the pheasant-turkey hybrids were superior to that reported for domestic fowl-turkey hybrids but about equal to that of pheasant-fowl hybrids.

The hybrids from pheasant eggs hatched after 20 days incubation and those from turkey eggs after 27 to 28 days. The average incubation period for pheasants is 24 days and for turkeys, 28 days.

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Some facts and figures on feed efficiency improvement quoted in A Progress Report to the American Feeder (*Feeding Forum*, Oct. 1955) include the following:

"The annual average egg production per bird has increased from 121 in 1930 to 190 in 1955.

"Chicken meat production per 100 lb. of feed was 20 lb. in 1930, and 38 lb. in 1955.

"Turkey meat production per 100 lb. of feed was 15 lb. in 1930, and 25 lb. in 1955."

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To assure inclusion, copy must be supplied by the 5th of the month preceding date of issue (January 5 for February issue; February 5 for March issue, etc.).

NEW JERSEY: Fully equipped small animal hospital. Long established. Main highway. Excellent buildings. Fast growing area. Good following, in excellent location. Address Box 191, Livingston, New Jersey.

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VETERINARIAN WANTED: Leading Midwest ethical biological and pharmaceutical laboratory in veterinary field has excellent opportunity with good future available for young veterinarian interested in professional writing, public and professional relations, and field evaluations of new products. Practice experience desirable. Write, defining interest and stating any experience or training in above fields. Address No. 291 care VETERINARY MEDICINE.

EXCELLENT TEXAS PRACTICE. 90% small animal. Completely equipped hospital. No real estate. Grossed $24,000 last year. $10,000 takes all. Must sell quickly because of other interests. Address No. 292 care VETERINARY MEDICINE.

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WANTED TO PURCHASE: A well established mixed practice in the Middlewest by experienced veterinarian. Describe any real estate involved. Address No. 293 care VETERINARY MEDICINE.

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DOG BOOKS—GENERAL: All by Will Judy. Canine Genetics (Principles Dog Breeding) $4. Kennel Building and Plans $3. Training the Dog $3. Dog Care and Keeping $2. Subscription $3 one year to Dog World Magazine 3323 Michigan Blvd., Chicago 16.

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FOR SALE: Mixed practice, established 29 years, 21 miles from Rochester, New York. Plenty of state work, $5000. for business, drugs, and equipment. Will rent real estate or sell. Wish to retire. Address No. 297 care VETERINARY MEDICINE.

WANTED: Veterinarian for general practice in New England. House can be furnished at small animal hospital. State qualifications and salary expected in first letter. Address No. 298 care VETERINARY MEDICINE.

CALIFORNIA SMALL ANIMAL HOSPITAL: Modern, buildings and real estate including living quarters. Completely equipped, x-ray, instruments, refrigerator, grooming, etc. 100 animal capacity, 30 outside runs. $15,000. down. Terms. Owner retiring. Address No. 299 care VETERINARY MEDICINE.

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EXAMINATIONS

The next examination given by the Board of Veterinary Examiners for veterinarians to become licensed in Ohio will be conducted on June 5 and 6, 1956, in the Clinic Building, College of Veterinary Medicine, Ohio State University, Columbus. Applicants must be present at eight o'clock the morning of the first day.

Application forms may be secured from the Office of the Secretary Ex-Officio, Division of Animal Industry, Room 709, State Office Building, Columbus 15, Ohio. All forms must be returned to the Secretary not later than May 5, 1956.

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Doctor Wixom Appointed Chief California Livestock Disease Control

The State Department of Agriculture announced the appointment of Dr. H. G. Wixom to the position of Chief of the Bureau of Livestock Disease Control pending civil service examination by the State Personnel Board to fill the position permanently.

Doctor Wixom was formerly Assistant Chief of the Bureau and succeeds Dr. H. P. Bonnikson, recently retired. He is a native Californian, born and reared in San Bernardino. He attended San Bernardino Valley College during 1931-34 as a pre-veterinary student, after which he entered Kansas State College to graduate with a degree of Doctor of Veterinary Medicine, in 1938.

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A county-wide program to reduce the fox population was begun recently in Barbour County, Alabama, with the announcement that a $2.50 bounty would be paid for each fox tail delivered to the county agent's office. Rabid foxes have caused some considerable losses in cattle herds due to rabies among this species of wild life.

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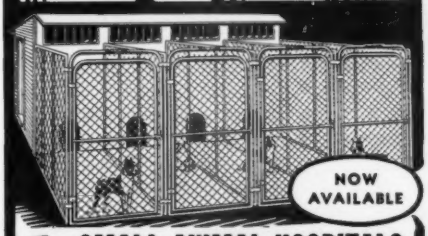

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Honor Dr. William R. Leighty

The warm-hearted boost a western Minnesota veterinarian has given his county's 4-H clubs during the past 44 years received recognition recently as Lac qui Parle county, Minnesota, 4-H'ers and their families staged a party for "Doctor Bill".

Dr. William R. Leighty

"Doctor Bill" — Dr. William R. Leighty — received a beautiful television set and a purse of money from the grateful group. Born in Albert Lea in 1886, he received his veterinary degree from McKillip Veterinary College, Chicago, and settled in Madison about 1911.

There began his remarkable and generous service to county 4-H youngsters—vaccinating and testing 4-H dairy cows, steers, pigs, and sheep free of charge. Each year, according to Lac qui Parle County Agent, George M. Gehant, Jr., of Madison, "Doctor Bill" has worked with at least 50 4-H'ers. Gehant estimates the kindly veterinarian has driven 400 miles a year on 4-H animal testing and treating missions.

This year, Doctor Bill's 70th, he TB-tested 64 4-H calves, examined and treated ten lambs and vaccinated 20 4-H pigs against cholera. The champion lamb of the 1935 Junior Livestock Show, exhibited by Merlin Knorr, now president of the Lac qui Parle County 4-H Leaders' Council, got his clean bill of health from Doctor Leighty.

Doctor Bill's service to 4-H began about the time the late Arthur J. Kittleson, State 4-H Club Leader from 1940 until his retirement and death in 1949, began the "Boys' Club" work, one of the several movements later to

(*Continued on page XLIV*)

double-duty combination with proved advantages

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Enhances effectiveness of each antibiotic.

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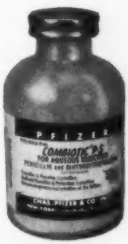

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Dr. Bernard LaSalle Named General Manager of Arnold Laboratories

Dr. Bernard LaSalle, L.A.S., D.V.M., has been named general manager of Arnold Laboratories, New Castle, Indiana, manufacturers of veterinary pharmaceuticals.

Doctor LaSalle was born in Joliette, Quebec, Canada, and attended Oka Agricultural College, La Trappe,, Quebec, University of Montreal. After graduating with top ratings he

Dr. Bernard LaSalle

became assistant professor of botany and genetics at Oka. Later he was laboratory assistant to the professor of bacteriology, histopathology and contagious diseases at Quebec College of Veterinary Medicine, University of Montreal. Here he completed a four-year course in veterinary science and received the degree of Doctor of Veterinary Medicine.

From 1937 to 1941, and from 1944 to 1947, Doctor LaSalle was associated with the Canadian Federal Department of Agriculture at the Animal Diseases Institute, Hull, Quebec, and was concerned with the manufacture of tuberculin, mallein, and johnin, and was also active in the fields of Brucella abortus antigens, serology, allergy, bacteriology, and pathology.

He was appointed veterinary bacteriologist in charge of Accurate Laboratories, London, Ontario, in 1941; being licensed by the Veterinary Director General of Canada. He was a staff member of the Federal Department of National Health and Welfare, Laboratory of Hygiene, Ottawa,, Canada,, from 1947 to 1952, at which time he joined the Arnold Laboratories as director of research.

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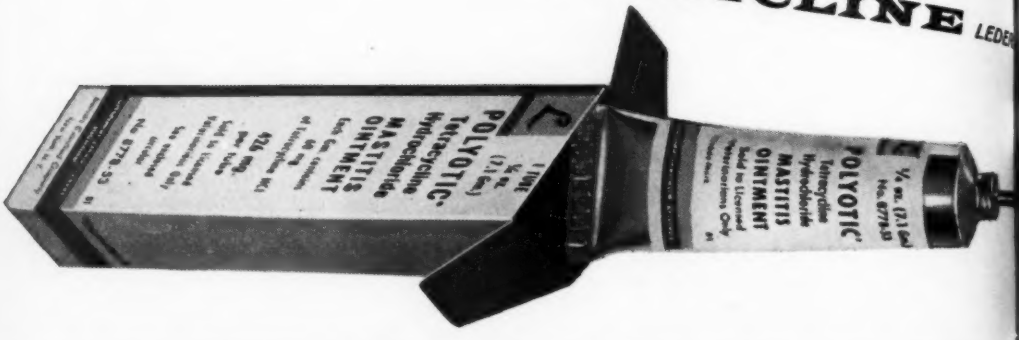

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Over 400 mg. tetracycline per infusion tube, in a nonirritating ointment base that permits persisting, active concentrations of this new, broad-spectrum antibiotic for over 48 hours with a single infusion, even though the udder is milked out every 12 hours.

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- Porcine origin—a natural host vaccine
- Modified by rabbit passage
- With serum gives immediate protection
- Can not spread cholera
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- Permits steady gains
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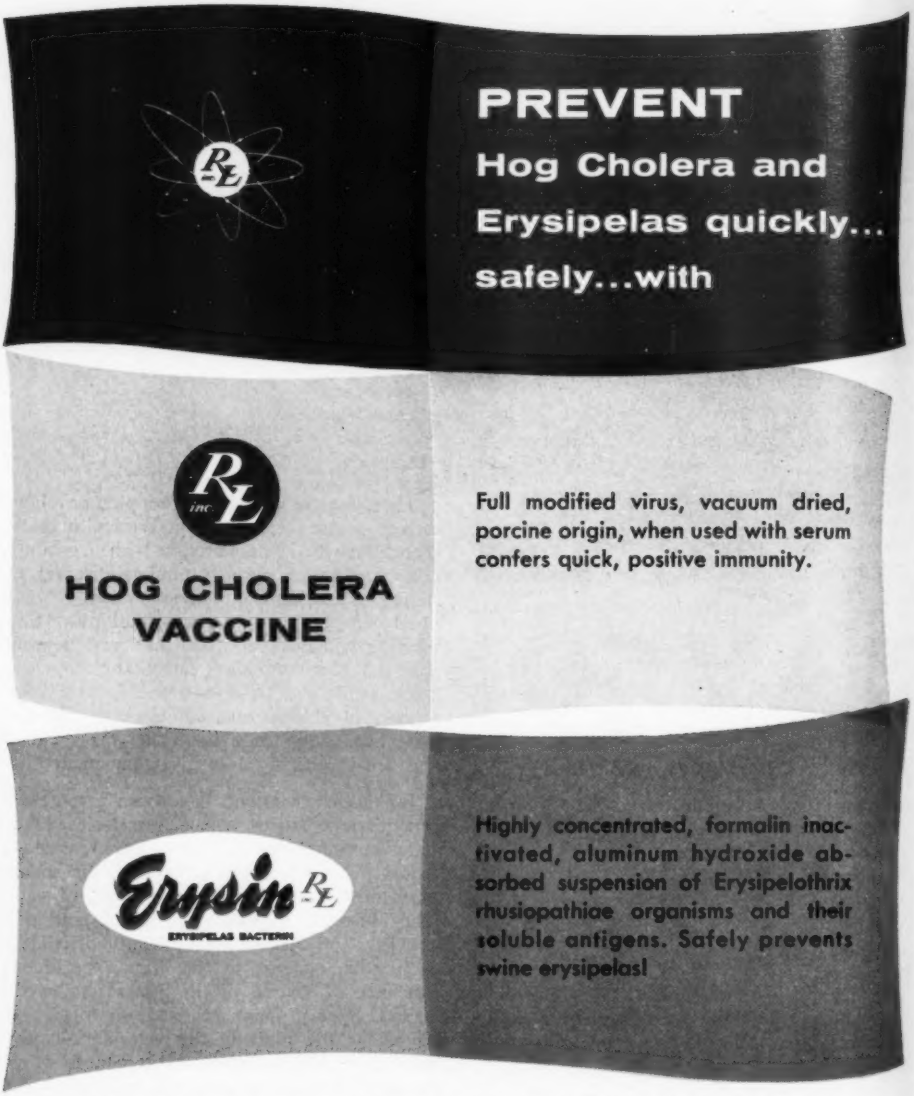
Foreign Diseases Subject of Proposed Regional Meetings

Foreign animal diseases that are considered potential threats to United States livestock and poultry and their similarity to endemic diseases of the United States will be discussed in detail at a series of six regional two-day meetings to be held in March and April. The Agricultural Research Service, in cooperation with the livestock sanitary officials in the states where the meetings are being held, are sponsors of these meetings ,at which time recognized experts on the foreign diseases will present the symptomatology and pathology of these conditions to veterinarians who it is believed will be the first to come in contact with outbreaks of such exotic diseases.

State	*Location*	*Dates*
Region 1		
Arizona New Mexico Nevada California	Phoenix, Arizona (USO-25 East Van Buren Street)	3/15-16-17
Region 2		
Oklahoma Arkansas Texas Louisiana Mississippi	Stillwater, Okla. (Oklahoma A & M College)	3/19-20-21
Region 3		
Montana Idaho Oregon Washington Wyoming Utah Colorado	Bozeman, Montana (Montana State College)	3/22-23-24
Region 4		
Iowa N. Dakota S. Dakota Nebraska Kansas Minnesota Missouri Wisconsin Illinois Michigan Indiana Ohio	Ames, Iowa (Iowa State College)	3/27-28-29
Region 5		
Georgia Florida Alabama S. Carolina *N. Carolina* Tennessee Kentucky West Virginia Virginia	Athens, Georgia (University of Georgia)	4/9-10-11
Region 6		
Connecticut Maine New Hampshire Vermont Massachusetts Rhode Island New York New Jersey Pennsylvania Maryland Delaware	Storrs, Conn. (University of Connecticut)	4/17-18-19

These regions coincide with a plan developed during recent years by the Agricultural Research Service in cooperation with a group of collaborators on foreign poultry diseases designed to establish a regional system of diagnosis of poultry disease conditions. Each meeting will begin at 1:00 p.m. and continue until 12 noon two days later. The state livestock sanitary official and the federal veterinarian in charge of ARS activities in each state are acting as cohosts for the meetings and are in charge of local arrangements.

Invitations to attend have been extended to practitioners (through the secretaries of all state veterinary medical associations), state and federal livestock sanitary officials, the schools of veterinary medicine, departments of veterinary science or pathology in the land-grant colleges, and certain public health officials in each state, because of the human health significance of several of the diseases to be discussed. Special emphasis is being placed on having at the meeting the veterinarians who have been designated to be in charge of the program for the control of emergency outbreaks of diseases, diagnostic laboratory workers, college clinicians, extension veterinarians, and others who may be called in for consultation with practitioners because of unusual disease occurrences. It is hoped through this series of meetings to have these key people thoroughly familiar with the foreign diseases that are considered most likely to gain entrance into the United States, as well as to inform them as to what organization has been planned for coping with these emergency outbreaks of foreign diseases.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Hog Cholera and
Erysipelas quickly...
safely...with
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Full modified virus, vacuum dried, porcine origin, when used with serum confers quick, positive immunity.
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Highly concentrated, formalin inactivated, aluminum hydroxide absorbed suspension of Erysipelothrix rhusiopathiae organisms and their soluble antigens. Safely prevents swine erysipelas!

These two products used simultaneously offer safety, efficiency and reliability in the prevention of Hog Cholera and Swine Erysipelas.

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Con-O-Mineral can be self-fed, mixed with grains, mashes, slop, salt or spread on ensilage. Primarily for swine and poultry, it is a nutritional supplementary feed for all livestock and poultry.

In swine, Con-O-Mineral helps correct failure to breed, runts, anemia, rickets, hairlessness, goiter, poor milk yield, posterior paralysis and other Nutritional Deficiency Troubles.

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is an excellent remedy

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Sioux Falls, S. Dak.

(Continued from page XXXII)

grow into 4-H Club work. Kittleson was then Lac qui Parle County Superintendent of Schools and later became associate State 4-H Club Leader under T. A. "Dad" Erickson, now in his 84th year.

A long time member of the Minnesota State Veterinary Medical Society, Doctor Leighty has held several important committee posts in the group.

MEETING CALENDAR

Alabama Veterinary Medical Association. Annual meeting. Whitley Hotel, Montgomery, Ala., Mar. 18-20, 1956. M. K. Heath, School of Veterinary Medicine, Alabama Polytechnic Institute, Auburn, secretary.

Arkansas Veterinary Medical Association. Annual convention. Marion Hotel, Little Rock, March 27-28-29, 1956. W. W. Taegel, 908 Broadway, Little Rock, secretary-treasurer.

Washington State College Annual Conference for Veterinarians. College of Veterinary Medicine, State College of Washington, Pullman, Wash., Apr. 2-4, 1956. John R. Gorman, chairman.

North Central Iowa Veterinary Medical Association. Warden Hotel, Fort Dodge, Iowa, April 19, 1956. H. Engelbrecht, Fort Dodge Laboratories, Fort Dodge, secretary-treasurer.

Eastern Iowa Veterinary Association 22nd Annual All-Day Practitioners' Clinic. Hawkeye Downs, Cedar Rapids, Ia., May 8, 1956. Forrest E. Brutsman, Traer, secretary.

American Animal Hospital Association. Annual meeting. Hotel Fontainebleu, Miami Beach, Fla., May 23-26, 1956. W. H. Riser, 5335 Touhy Ave., Skokie, Ill., executive secretary.

Georgia Veterinary Medical Association. Annual meeting. General Oglethorpe Hotel, Savannah, June 10-21, 1956. C. C. Rife, 505 Lindbergh Dr., N. E. Atlanta.

California State Veterinary Medical Association. Annual Convention. Hotel Statler, Los Angeles, June 11-13, 1956. Charles S. Travers, 3004 16th Street, San Francisco, executive secretary.

Vermont Veterinary Medical Association. Annual Summer Conference. The Lodge at Smuggler's Notch, Stowe, Vermont, June 21-22, 1956. A. E. Janawicz, Department of Agriculture, Montpelier, secretary.

Michigan State Veterinary Medical Association. Annual meeting. Bancroft Hotel, Saginaw, Mich., June 21-22, 1956. Paul V. Howard, 4011 Hunsberger, N.E., Grand Rapids, secretary.

North Carolina Veterinary Medical Association. Annual meeting, Greensboro, N. C., June 25-27, 1956. C. J. Lange, 3741 Hi-Pt. Rd., Greensboro, secretary-treasurer.

Maritime Veterinary Associations. Joint conference. June 26-28, 1956, Mount Allison University, Sackville, New Brunswick. J. F. Frank, Sackville, secretary joint committee.

(Continued on page XLIX)

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Viracine is the only tissue cultured hog cholera vaccine. It provides live modified virus completely controlled and checked for virulence, safety and potency! Animal passage plays no part in its modification and has no part in its production. In the face of known exposure to hog cholera, pigs vaccinated as long as three years before with VIRACINE and anti-hog cholera serum have proved to be SOLIDLY IMMUNE.

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LEADER FOR YEARS IN HOG CHOLERA VACCINES.

FOR PROBLEM HERDS **B.T.V.®/CUTTER**
• Safe, too, for pregnant sows • Can't spread hog cholera • Does not throw pigs off feed • No virus setback • Economical to use.

"Millions of hogs have gone to market protected by B.T.V."

Dr. Louis A. Merillat

1868-1956

Dr. Louis A. Merillat, veterinarian, author, soldier, and teacher died at his home in Chicago, February 25, 1956, at the age of 88 years. Funeral services were conducted in the Fort Meyer Chapel, at 2 p.m. on March 1, and interment was in Arlington National Cemetery, with full military honors befitting his rank of Colonel, Veterinary Corps, U. S. Army

Dr. Louis A. Merillat

retired. Colonel Merillat served as chief veterinarian, First Army, American Expeditionary Forces in France, during World War I, at the conclusion of which he was made a foreign correspondent of the *Academie de Medicine Veterinaire de France* and *Chevallier de la Legion d' Honneur* of the Republic of France.

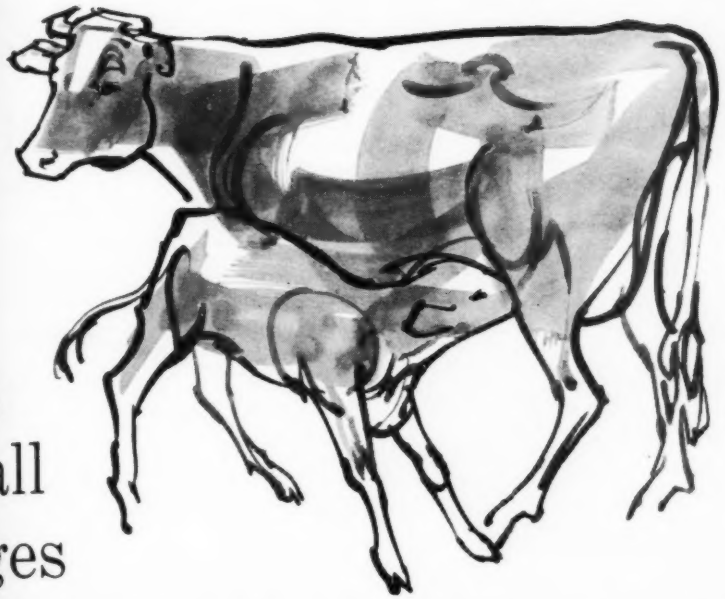
Though a distinguished soldier, Doctor Louis Merillat served his profession with distinction through a long and brilliant career. Attesting to his unselfish devotion to organized veterinary medicine and to its literature, he was honored in 1950 by being presented the A.V.M.A. Award. In this fashion, a grateful organization representing all veterinarians in the United States, expressed its appreciation for meritorious service. He was described on the occasion of the presentation ceremonies at the opening session of the A.V.M.A. Convention held in Miami Beach, Florida, August 21-24, 1950, as "—the international dean of veterinary journalists and one who has set an unequalled standard for excellence."

Following graduation from the Ontario Veterinary College in 1888, Doctor Merillat began an amazing career marked by continuous service,, to organized veterinary medicine, until the time of his death. He was one of the three founders of the McKillip Veterinary College (1892) and of the Chicago Veterinary Society (1896). He served as the secretary of the former and was one of the early presidents of the latter, and was a past president and past secretary of both the American and the Illinois Veterinary Medical Associations. For over ten years he represented his own district (Missouri, Indiana, Illinois) as a member of the Executive Board of the National Association. For an equal period he was president of the Illinois Board of Veterinary Examiners. Of all honors and distinctions earned, Merillat preferred to be known by such work as inspiring wealthy M. H. McKillip to found the first of the three-year, proprietary veterinary colleges —one that would stand out from the two-year pattern of that day and possibly induce the others to follow the example for the betterment of the faulty educational system that had been too long neglected. He also pointed with pride to the passing of the Illinois Veterinary Practice Act (1899) after a bitter ten-year legislative fight.

In 1914, Doctor Merillat quit teaching to devote all of his time to the firm of Wright and Merillat who enjoyed one of the most important veterinary clienteles ever developed in this country. I have heard him tell of the work in the huge stables of Marshall Fields, Bowman Dairy, and other concerns in Chicago who maintained stables containing large numbers of horses used for delivery and transfer.

He championed improvements in the national organization, generally against determined opposition, with tact that strengthened the organization and effectiveness of its work as well as encouraging its flourishing growth.

Doctor Merillat was a prolific writer for most of his professional life. He was a firm believer in telling his colleagues everything he knew about clinical veterinary medicine, but he was the last to claim that his early books and articles were even passable from a literary point of view. During subsequent years a seemingly endless file of articles followed, each having a distinctive flavor as well as academic refinement that lent firm leadership in all professional activities. He never retired completely, serving to the last as editor emeritus of the national Journal.



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(Continued from page XLIV)

Maryland State Veterinary Medical Association. Annual summer meeting. George Washington Hotel, Ocean City, Md., June 28-29, 1956. John D. Gadd, Cockeysville, secretary.

Mississippi State Veterinary Medical Association. Annual meeting. Buena Vista Hotel, Biloxi, Miss., July 15-17, 1956. Harvey F. McCrory, Box 536, State College, Miss., secretary.

Iowa State College Annual Conference for Veterinarians. Memorial Union, Iowa State College, Ames, Ia., July 17-18, 1956. Drs. John B. Herrick and D. L. Baker, chairmen.

Virginia Veterinary Medical Association. Semiannual meeting. Natural Bridge Hotel, Natural Bridge, Va., July 17-19, 1956. Wilson B. Bell, 1303 Hillcrest Drive, Blacksburg, secretary.

Alabama Polytechnic Institute Annual Conference for Veterinarians. School of Veterinary Medicine, Alabama Polytechnic Institute, Auburn, Ala., July 22-25, 1956. R. S. Sugg, dean.

Pennsylvania State Veterinary Medical Association. Annual meeting. Bedford Springs Hotel, Bedford, Pa., September 12-14, 1956. Raymond C. Snyder, N.W. Corner Walnuts St. and Copley Rd., Upper Darby, Pa., secretary.

Washington State Veterinary Medical Association. Annual meeting. Davenport Hotel, Spokane, Sept. 21-22, 1956. P. J. Pfarr, 6306 N. Wall, St. Spokane, general chairman.

Oklahoma Conference for Veterinarians. School of Veterinary Medicine, Oklahoma A & M College, Stillwater, September 27-28, 1956. A. L. Malle, Department of Veterinary Pathology, chairman.

American Veterinary Medical Association. Annual meeting. Municipal Auditorium, San Antonio, Tex., October 15-18, 1956. J. G. Hardenbergh, 600 S. Michigan Ave., Chicago, Ill., executive secretary.

Eastern Iowa Veterinary Association. Annual meeting. Hotel Montrose, Cedar Rapids, Ia., October 4-5, 1956. Forrest B. Brutsman, Traer, secretary.

United States Livestock Sanitary Association, 60th annual convention, Hotel Morrison, Chicago, Ill., Nov. 28-30, 1956. Dr. R. A. Hendershott, 33 Oak Lane, Trenton 8, N. J., secretary.

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---DEATHS OF VETERINARIANS—

Glen L. Allen, Paris, Ill., TH '15, Nov. 13, 1955.

Philip R. Allen, Volga, Ia., ISC '49, Nov. 29, 1955.

John P. Beck, Dual Park, Md., ONT '06, Sept. 26, 1955.

Walter A. Brown, Columbus, Ohio, OSU '06, Nov. 17, 1955.

F. L. Cissell, Perryville, Mo., KCV '11, Jan. 13, 1956.

Stanley R. Cooper, West Hollywood, Calif., OSU '41, Nov. 21, 1955.

Frederick C. Dettner, Riverhead, N. Y., NYA '04, Sept. 13, 1955.

Burman J. Elander, San Diego, WSC '38, July 23, 1955.

James A. Flanigan, Eugene, Ore., WSC '20, Nov. 25, 1955.

William B. Fleming, Montgomery, Ala., UP '05, Aug. 27, 1955.

Charles A. Griffin, Albany, N. Y., COR '13, date unknown.

George A. Hawthorne, Clarinda, Ia., KCV '18, Nov. 9, 1955.

Harry B. Hickman, Sweet Springs, Mo., KSC '20, Nov. 24, 1955.

Everett I. Holman, Decatur, Nebr., IND '18, Aug 1, 1955.

James W. Hughes, Elkton, Md., USCVS, '18, Nov. 9, 1955.

William S. Lobach, Eaton, Pa., OSU '44, Dec. 26, 1955.

Clifton D. Lowe, Washington, D. C., OSU '10, Dec. 23, 1955.

Frank W. Major, Ft. Scott, Kan., ST J '18, Oct. 5, 1955.

Evan L. Moul, Rock Island, Ill., OSU '36, Nov. 13, 1955.

Robert F. Okershauser, Milwaukee, Wis., MCK '08, Dec. 3, 1955.

Harry W. Orr, Stillwater, Okla., ISC '18, Jan. 14, 1956.

Walter S. Packer, Oneonta, N. Y., UP '49, Nov. 7, 1955.

Archa L. Peterson, Clarks Hill, Ind., MCK '16, July 6, 1955.

Robert J. Potteiger, Selinsgrove, Pa., UP '18, Dec. 15, 1955.

J. H. Ryland, Selma, Ala., ALA '23, Jan. 26, 1956.

William T. Scarborough, Raleigh, N. C., KCV '17, November 1955.

Herman W. Schmees, Oklahoma City, Okla., USC '21, Feb. 9, 1956.

Roland D. Shireman, Richland Center, Wis., KCV '03, July 30, 1955.

Ralph L. South, Henderson, Iowa, KCV '14, Dec. 12, 1955.

Albert E. Stettler, Newark, Ohio, OSU '16, Oct. 21, 1955.

James T. Stuart, Alliance, Ohio, CHI '89, Oct. 15, 1955.

Walter E. Thistlewaite, Portland, Ore., WSC '21, Oct. 12, 1955.

Bror A. Utter, Seattle, Wash., MCK '16, July 9, 1955.

LeRoy Webber, Rochester, N. Y., ONT '94, December 12, 1955.

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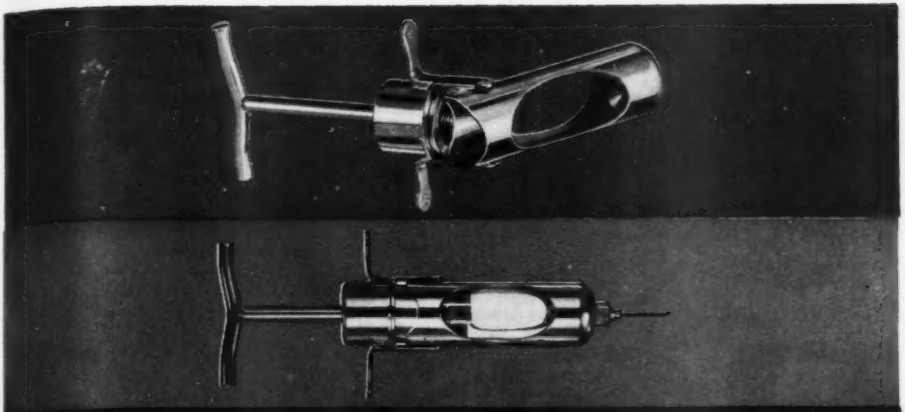

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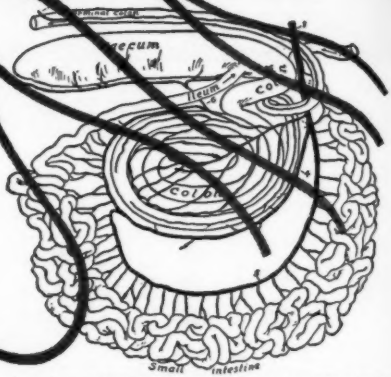

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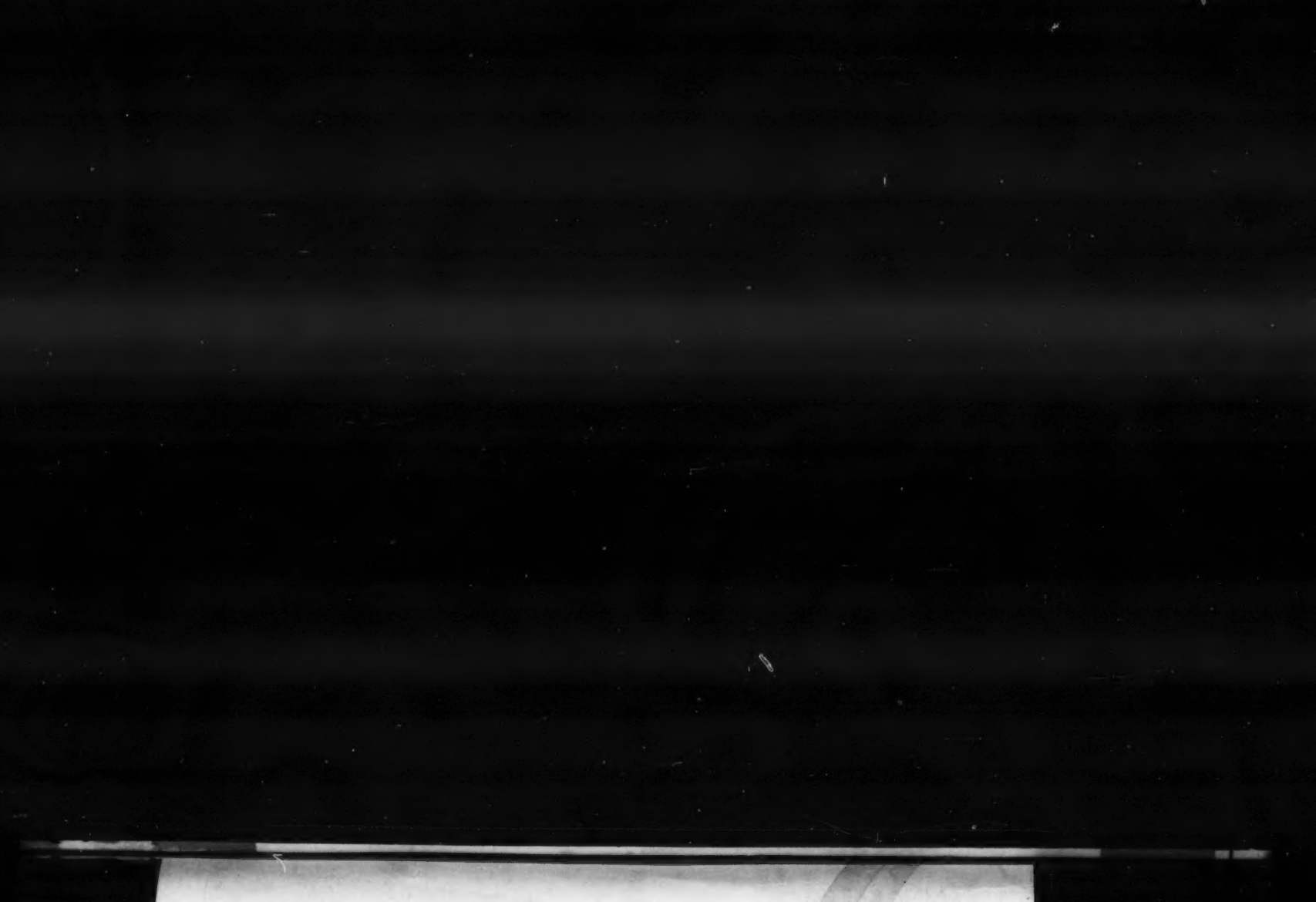
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